173/C

1957.

—

QUEENSLAND.

ANNUAL REPORT

OF THE

DEPARTMENT OF AGRICULTURE AND STOCK

FOR

THE YEAR 1956-57.

PRESENTED TO PARLIAMENT BY COMMAND.

BRISBANE:
BY AUTHORITY: A. H. TUCKER, GOVERNMENT PRINTER.

A. 38—1957.

A S P
RAM
M M

COMMONWEALTH MYCOLOGICAL INSTITUTE
30 DEC 1957

ORGANISATION OF THE DEPARTMENT AS AT 30th JUNE, 1957.

SECRETARY FOR AGRICULTURE AND STOCK .. .. Hon. H. H. Collins, M.L.A.

CENTRAL ADMINISTRATION—

Under Secretary	A. F. Bell, M.Sc., D.I.C., A.R.A.C.I.
Assistant Under Secretary (Technical)	W. A. T. Summerville, D.Sc.
Assistant Under Secretary	W. T. Gettons, A.I.C.A.
Special Administration Officer	H. Barnes.
Officer in Charge, Information Services	C. W. Winders, B.Sc.Agr.
Accountant	E. C. R. Sadler, A.A.U.Q.

DIVISION OF PLANT INDUSTRY—

Director of the Division .. .. W. G. Wells.

Agriculture Branch—

Director of Agriculture .. .. W. J. S. Sloan, M.Sc.Agr.

Regional Experiment Stations Branch—

Director of Regional Experiment Stations .. .. W. J. Cartmill, M.Sc., A.R.A.C.I.

Horticulture Branch—

Director of Horticulture .. .. S. A. Trout, M.Sc., Ph.D.

Science Branch—

Sections of Botany (S. L. Everist, B.Sc., Government Botanist); Entomology (W. A. McDougall, D.Sc., Chief Entomologist); and Plant Pathology (J. H. Simmonds, M.B.E., M.Sc., Chief Pathologist).

Chemical Laboratory—

Agricultural Chemist .. .. C. R. von Stieglitz, F.R.A.C.I.

DIVISION OF ANIMAL INDUSTRY—

Director of the Division	W. Webster, B.V.Sc.
Assistant Director	A. L. Clay, B.V.Sc.

Veterinary Services Branch—

Director of Veterinary Services .. .. .. C. R. Mulhearn, B.V.Sc.

Research Branch—

Chief Pathologist .. .. L. G. Newton, B.V.Sc.

Sheep and Wool Branch—

Director of Sheep Husbandry .. .. G. R. Moule, D.V.Sc.

Cattle Husbandry Branch—

Director of Cattle Husbandry .. .. .. D. N. Sutherland, B.V.Sc.

Pig and Poultry Branch—

Director, Pig and Poultry Branch .. .. .. A. L. Clay, B.V.Sc.

Biochemical Branch—

Biochemist .. .. J. M. Harvey, D.Sc., A.R.A.C.I.

DIVISION OF DAIRYING—

Director of Dairying .. .. E. B. Rice, Dip.Ind.Chem.

Field Services Branch—

Director of Field Services .. .. F. C. Coleman.

Research Branch—

Director of Research .. .. L. E. Nichols, B.Sc.Agr., A.R.A.C.I.

DIVISION OF MARKETING—

Director of Marketing	H. S. Hunter.
Assistant Director of Marketing	C. H. P. Defries, H.D.A., B.Com., A.F.I.A.

Standards Branch—

Standards Officer .. .. A. A. Ross, M.Agr.Sc.

CONTENTS.

	Page.
Report of the Under Secretary	1
Divisional Directors' Reports—	
Division of Plant Industry	14
Division of Animal Industry	22
Division of Dairying	29
Division of Marketing	35
Reports of Branches—	
Division of Plant Industry—	
Agriculture Branch	38
Regional Experiment Stations Branch	48
Horticulture Branch	54
Science Branch	61
Chemical Laboratory	65
Division of Animal Industry—	
Veterinary Services Branch	69
Research Branch	74
Sheep and Wool Branch	79
Cattle Husbandry Branch	83
Pig and Poultry Branch	89
Biochemical Branch	97
Division of Dairying—	
Field Services Branch	99
Research Branch	105
Division of Marketing—	
Marketing Branch	112
Standards Branch	118
Clerical and General	120

REPORT OF THE DEPARTMENT OF AGRICULTURE AND STOCK FOR THE YEAR 1956-57.

TO THE HONOURABLE THE SECRETARY FOR AGRICULTURE AND STOCK.

Dear Sir,—I have the honour to submit the annual report of the Department of Agriculture and Stock, recording the activities for the year ending June 30, 1957.

In accordance with established practice the first part of the report comprises sections prepared by the Divisional Directors and myself for the purpose of giving an overall picture of Departmental activities and their relations to primary industry. The more detailed treatment of activities, prepared by Branch Heads, then follows.

Production statistics are set out in Tables 2 (animal industries) and 3 (plant industries). Production is recorded separately for the past five years and compared with the five-year averages for the immediate pre- and post-war quinquennia. Rainfall data for the 19 meteorological districts are presented in Table 1.

SEASONAL CONDITIONS.

Seasonal conditions were markedly "below par" in many areas. Following the excessively wet autumn and early winter of 1956 there was a sudden transition to abnormally dry weather. There followed a dry, cold spring, with unusually late and heavy frosts in southern areas. Fair to good relief rains fell in December but the monsoonal wet season terminated abruptly. Falls were uneven within districts, fair seasonal conditions contrasting with poor, but the late autumn was dry throughout the southern part of the State.

The effect on production varied: Generally, the pastoral industries fared fairly well, with conditions being better in sheep than in cattle areas. However, unless good spring rains are received soon the outlook will deteriorate rapidly.

Production in the dairy industry suffered from both the dry spring and the dry autumn. Pastures became dry and there was an almost total failure of late autumn and early winter grazing crops. Whilst two rain groups at the end of June and beginning of July gave some relief, the current outlook is far from good.

In North Queensland the below-average rainfall meant above-average sunshine and sugar-cane crops have done well. In the south the cane crops have suffered from severe droughty conditions, as also did most other crops. Summer forage crops failed over widespread areas and planting of winter crops was seriously delayed. Good spring rains are urgently needed for winter cereals, of which reserve stocks have disappeared.

THE ECONOMIC OUTLOOK.

The Australian nation has had a successful trading year. The value of exports for the year 1956-57 reached the record total of approximately £1,000 millions and overseas balances increased by some £300 millions during the year. It is true that this very favourable trade balance was to some extent achieved by import restrictions; nevertheless the overall position is gratifying and fully justifies the opinion of conditioned optimism expressed by the Australian Agricultural Council in July.

As usual the export earnings were based mainly on the sale of surplus primary produce. It is very fortunate for this country that primary producers have lifted their output. Although the population of Australia has risen from 7·5 millions in 1945 to 9·5 millions (28 per cent. increase) we have been able to create an export record, and so maintain a flow of imports of essential goods.

Wool again stands pre-eminent and exports during 1956-57 were valued at approximately £500 millions, or 45 per cent. more than in the previous year. This was due to both increased production and higher prices. Australia now has a sheep population of some 150 millions and the continually improving management and pasture practices should ensure the continuation of the upward trend in production. Fortunately, the world demand for wool stands firm, the increased buying capacity due to rising world standards of living apparently balancing the increasing competition from synthetics.

The fact that half the nation's export earnings came from wool emphasises our unhealthy over-dependence on that commodity. It is therefore pleasing to see an increasing volume of exports of manufactured products and minerals. This is particularly so in view of the presently unfavourable export market for a number of important primary products. In the interests of economic stability it is most desirable that every effort be made to lift the export of manufactured goods progressively.

The export position in respect of the other animal industries was not nearly so favourable.

The price for butter on the United Kingdom market in the early part of 1957, at 247s. stg. per cwt., was little more than 60 per cent. of the peak 1955 price. This was due in considerable

part to oversupply of the market by both Australia and New Zealand, following a very good season. However, the price had improved by some 80s. stg. per cwt. by the end of the financial year.

It is evident that a more strict control of the export programme of Australia and New Zealand is necessary, whilst greater attention must be paid to quality and merchandising by the national authorities. The Queensland Butter Marketing Board has shown commendable enterprise in diversifying its production, in giving attention to packaging, and in sending its Manager abroad twice in order to probe the market potential of the East.

The renewal for a further five years from July 1st, 1957, of the Commonwealth Dairy Stabilisation Scheme (which varies little from the previous scheme and provides guaranteed prices for butter and cheese to the extent of Australian consumption, plus 20 per cent.) has assured the continuance of a stable condition for the dairy industry. However, the price outlook for export butter is clouded by the weight of supplies likely to continue to be received on the United Kingdom market. The lower price on the export market must have its effect on the over-all return to dairymen.

A generally favourable season has resulted in record beef production but marketing prospects are not rosy. For periods of the year the returns on the London market fell below the price guaranteed by the United Kingdom under the provisions of the 15-Year Meat Agreement; deficiency payments amounting to £3,250,000 were accordingly paid to the Commonwealth with respect to 1956 sales of beef. Sales on the United Kingdom market were depressed by competition from subsidised home-grown beef and high quality chilled and frozen beef from the Argentine.

It is obvious that the arrangements for the marketing of the beef crop are unsatisfactory, and that meat quality and regularity of delivery call for improvement. More attention, also, might be paid to the potential market for live cattle in the East.

Australia's traditional market for eggs in the United Kingdom collapsed. Under the influence of a subsidy, aggregating about £30 millions sterling annually, the United Kingdom is presently producing about 95 per cent. of its requirements of shell eggs. Prices in 1956-57 were about 1s. 6d. per dozen below the 1955-56 prices and growers netted only about 1s. 6d. per dozen from shell egg sales and 2s. 3d. per dozen from pulp sales.

The Commonwealth Government has refused to give temporary relief in the form of subsidy and there can be no doubt that the egg industry faces an unpromising future.

The outlook for sugar remains stable. The International Sugar Agreement was amended in Geneva in November, 1956, when international sales quotas were revised. At this time the world price was 3·25 cents per pound but, favoured by droughty conditions in the Caribbean and wet conditions in Europe, the price steadily rose to a maximum of 6.85 cents in April; at 30th June, 1957, the price was 6.15 cents. This more than compensated for the withdrawal of New Zealand from the Commonwealth Sugar Agreement, thus reducing Australia's negotiated price quota from 314,000 tons to 300,000 tons.

The annual price review for the "negotiated price quota" under the terms of the British Commonwealth Sugar Agreement resulted in an increase of £1 8s. 4d. stg. per ton for 1957 sugar, while the Australian domestic price was increased to 10d. per lb. retail in May, 1956. The overall average price for the 1956 season's production was £A46 10s. 6d. per ton, an increase of £A4 4s. 1d. on the 1955 figure.

The export grain market is somewhat sluggish: The higher protein Queensland wheat finds a ready export sale but through a combination of seasonal conditions and ill-advised advocacy of diversion to other grains, the deficiency in production precluded any export. This may react very unfavourably on the hard-won markets for premium wheat and flour.

Barley sold well at fair prices on both export and home markets and the outlook is reasonably well assured. Linseed, aided by large-scale contracts at declared prices, is also stable at present levels of production. On the other hand, the canary seed market weakened and export prices were little more than half those of last year; this market is very vulnerable to competition from North African countries.

All things considered it is apparent that wheat, particularly high-protein wheat, will in the long term prove the most reliable and profitable grain.

The Queensland tobacco crop is estimated at the record figure of 2,370 tons but Australian production is still only about one-fifth of the country's requirements. There is thus a certain market for greatly increased production. The average price for the 1956-57 crop (to date at 129 pence per lb.) should be satisfactory on the whole; however the frequent appearance of only one effective buyer at auctions creates some feeling of uncertainty, while the definition and evaluation of grades of leaf remain somewhat controversial. The Commonwealth Government has announced the following percentage inclusions of Australian leaf in manufactured tobacco in order to qualify for duty rebates:—

——	Cigarettes.	Cut Tobacco.
1956–57	7½	17½
1957–58	12½	21
1958–59	14½	22½

Fruit and vegetable production, as a result of unfavourable seasonal conditions, was generally below local market requirements, though apple, pear and grape crops created records. Surplus quantities of apples found a ready sale in the East. The canned pineapple export market is slow and facing increasing competition, particularly from Formosa, South Africa and Malaya; prospects are only fair.

FARMING WITH MACHINES.

In an era of full employment and growing social services the itinerant and casual farm labourers are rapidly disappearing. The farmer's family no longer remains under the parental roof, providing a reliable and cheap source of labour.

The farmer must therefore increasingly rely upon his own labour and that of permanent employees. He cannot call upon continuous reserves of seasonal labour for planting, weeding, or harvesting. The only alternative is increasing mechanisation, with an appropriate implement for each job.

Whilst full mechanisation enables a small skilled labour force to cover a lot of ground in a short time, and enables continuous employment of that labour force, it nevertheless greatly increases capital investment. The profitability of this high investment can only be assured by increased production,, which in turn means the acquisition of more land or the cultivation of a greater proportion of existing farm properties. In general, however, mechanisation means larger farms.

Few people appreciate the extent to which farm mechanisation has progressed since the war. The number of tractors in Queensland in 1945 was slightly less than 15,000, whereas it has now incerased to over 45,000. In the sugar industry there are now three tractors for every two farms. Milking machines have likewise increased from 33,000 milking units in 1945 to 50,000, and it is estimated that 80 per cent. of commercial dairy farms now milk by machine.

There has been an impressive post-war development and usage of new types of machine, as the following examples will testify:—

The axeman, ringbarking and felling timber, is fast disappearing and land clearing has been mechanised. Giant bulldozers, with or without a heavy ball and cable, push or pull trees out of the ground and stack them for burning. Rotary cutters, slashers, and bruisers have been developed for the eradication of bracken, lantana, shrubs, and even saplings up to three inches in diameter. Millions of acres of fertile land is covered with brigalow, a tree very tenacious of life; the problem of its eradication is now being solved by hormone spraying from aeroplanes or by the use of the Majestic plough.

Primary tillage is changing from the turning action of mouldboard and disc ploughs to the cutting and tearing action of tined implements such as chisel ploughs. This change reduces "hardpans," improves absorption of rain, and is less damaging to soil structure. There are now in use ganged chisel ploughs which cultivate the soil in strips up to 52 feet wide. Ploughing on this scale requires the use of a crawler tractor of 150-160 h.p. but a rapid and cheap job is done on a large farm.

"Clean" cultivation is now recognised as conducive to soil erosion and subsurface tillers have been developed in order to maintain protective stubble covering on the soil surface. With this has come the development of automatic and pneumatic seeders for planting on rough terrain and for the seeding of pastures.

The "sprig" planter, a machine designed for planting cuttings of grass, has radically changed the attitude towards grasses such as kikuyu and African star grass, which seed sparsely or not at all. This could be developed to permit planting of such grasses in broken and unprepared ground; it will be of great importance in establishing pastures; and of particular importance in planting waterways for the control of soil erosion, and healing eroded gullies.

In the sugar industry the planting machines automatically cut, plant, cover, and fertilize the cane cuttings; they now additionally spray the cuttings with fungicides before planting.

The endless scarifying for the mechanical control of weeds in row crops is fast giving way to control by chemical sprays using both pre-emergence and foliar sprays. This change helps conserve soil moisture and structure and avoids root mutilation.

The rapidly growing interest in pasture improvement has led to the local development of grass seed harvesters. This is contributing to the rapid spread of the new and valuable buffel grass.

Harvesting machinery has undergone a great change. The "all crop" harvesters facilitate harvesting of small-seed crops, have made feasible the harvesting of badly lodged crops, and provide for the disposal of straw by chaffing or baling. Bulk grain harvesters have been designed to be complementary to bulk storage and handling of grain and are eliminating the use of bags on the farm. Cotton harvesters are in common use and mechanical harvesting of sugar cane is increasing gradually; mechanical loading of harvested sugar cane is rapidly becoming general. Forage harvesters now harvest pasture or silage crops, chop them for ensiling, and automatically unload on to stack or into silo. (Automatic extraction of silage is also being developed.) Maize harvesters are in common use. Potato, onion, and other harvesters have been refined and come into wider use.

In irrigation the development of more efficient spray lines has reduced manpower necessary for water application; improved spray lines now permit a man and tractor to move a whole line in one piece. Automatic land levellers and graders have taken the burden off the preparation of land for flood irrigation; the use of low-pressure plastic hose is facilitating water distribution and reducing seepage losses.

Within particular industries, the peanut industry now has locally developed mechanical pulling and stooking of the nuts, stook loaders and pick-up threshers, and is now giving attention to artificial drying. Queensland leads the world in mechanised harvesting of peanuts.

Mechanical harvesting of tobacco is on the doorstep and soil injectors are being used in the control of soil pests.

In horticulture there has been great progress in the use of high pressure and wide boom sprays. Weed control, fruiting control, and minor element application are now effected through spraying. Hand thinning of stone fruits, a laborious and monotonous spring-time

operation in the orchard, may be superseded by spraying the young fruit with chemicals, of which DNOC is perhaps the most successful. Mechanical waxing or otherwise covering fruit is reducing storage loss.

Animal production does not lend itself to mechanisation to the extent possible on crop production. Nevertheless, mechanisation is advancing: Sheep shearing tables, to cradle the sheep during shearing or crutching, have speeded up these operations. Spray races, which are readily portable, are replacing the less convenient submergence dips. Mechanical self-feeders are increasing rapidly in pig and poultry farms. Hammer mills and farm mixers are being increasingly used in pig and poultry food preparation on the farm. Widespread farm refrigeration aids quality in milk and cream.

Posthole diggers, ditchers, scoops, loaders, portable power saws, and small mobile cranes are mechanical devices which have lightened much of the back-breaking toil of farming in the post-war years.

The greater number of these new machines have sprung from the native mechanical genius of the farmer. Many farmers have spent a good deal of money in translating their ideas into steel, testing them, and advancing to the stage where a machinery manufacturer takes over. A farmer rarely makes any money from his mechanical ideas.

It must not be thought that this great and rapid development of mechanisation has meant an equivalent displacement of labour. Rather has it meant a large degree of redistribution of labour. Six men working with scythes may be replaced *on the farm* by one man with a tractor and power mower. But the tractor and mower must be manufactured and serviced; fuel and oil must be drawn from the earth, refined, and distributed. Some of the six scythe men have gone into factories, into garages, into the oil business, and into the transport system. They are not working *on* the farm but they are working *for* the farm; they are just as much a part of the farm labour force as the driver of the tractor and mower.

It is true, of course, that not all displaced farm labour is absorbed by such redistribution. Some labour is displaced and it is well that this should be so. In the backward countries of the world up to 90 per cent. of the labour force is needed on the farms to produce the food and fibre necessary to feed and clothe the people. There is no surplus labour to provide or manufacture the many other things which make modern life worth living. It is only when farming efficiency improves that labour can be released for other production.

We should not worry unduly about the number of people working on the land itself. We should concern ourselves with the volume and quality of the production from each unit of land.

THE NATIONAL APPROACH TO ANIMAL PROBLEMS.

One of the outstanding and important post-war developments in Australia has been the rapid and continued growth of a national approach to problems of animal health and production.

It is true, of course, that the animal is the same the continent over and is not nearly so affected by variations in the climatic and soil environment as are plants. Consequently the animal industries lend themselves much more to the unified and co-ordinated approach by scientific investigators than do the plant industries. Nevertheless Australia has every reason to be well satisfied with the high degree of co-ordination which has been achieved by its animal scientists.

This trend has been fostered by, and is in a large measure attributable to, the Australian Agricultural Council and its ancillary Australian Standing Committee on Agriculture.

Through these agencies have been set up the Biennial Conference of Chief Veterinary Officers, and the Animal Production Committee with its several constituent technical sub-committees to deal with matters of cattle, sheep, pig, and poultry production. The periodic meetings of these units, together with numerous other specialised conferences, have served to integrate the Commonwealth and State animal science services.

There has, too, been increasing co-operation with industry at the national level and a notable acceptance by industry of responsibility for research. The Australian Meat Board has been particularly progressive and, *inter alia,* has borne the capital cost of establishing two cattle research stations in Queensland. One of these stations specialises in problems of cattle breeding and the other in cattle husbandry.

The result has been economy of effort and a much more rapid rate of progress than would otherwise have been attained. As a typical example might well be cited the approach to the problem of infertility and abortion in dairy herds—probably the greatest single problem confronting that great industry. By agreement, Commonwealth and State organisations are now carrying out a planned investigation of the many contributing factors—one State working on this, and another State on that. The mutual stimulus, and the economy in manpower, must achieve more results in less time, and at less cost, than would be possible without this national approach.

It is well that this is so. Australia, with its vast area, varied conditions, and sparse population, must use its inadequate technical manpower to the maximum possible advantage. This is particularly so in the animal industries, where the coupling of art and science has been somewhat slower than it has in agriculture.

This delay is due in considerable measure to the totally inadequate facilities for training in animal science available in Australia. In a country so largely dependent upon its animal industries it is amazing that there are but two

University Veterinary Schools and, until a very recent development in New South Wales, no other University Faculty in animal science.

The number of students entering any profession is directly dependent upon the facilities offering for specialised training; this has been proven time and again, in every State in the Commonwealth, following the establishment of a new Faculty within the University.

Nor should the extension of such training be limited to the creation of new Faculties of Veterinary Science. Time, expansion of knowledge, and increasing specialisation all decree the establishment of additional units which emphasise husbandry as well as units which emphasise medicine, pathology and surgery. Frequently there is a tendency to subordinate training in husbandry to qualify for a license to practise in veterinary medicine.

Indeed, it would seem that to ensure the meeting of the modern scientific needs of primary production, the course structures of all relevant faculties might be subjected to critical analysis and the need for new faculties explored.

ACHIEVEMENT IN RESEARCH.

The Director of the Division of Animal Industry draws attention (page 25) to the achievements in research which are being recorded in his Division.

The structure of the Departmental animal science service has been completely changed in the post-war period. Small independent Branches previously engaged solely in extension work have been expanded and integrated with the laboratory services to form a closely knit Division.

The old Animal Health Station at Yeerongpilly has become the Animal Research Institute, with modern pathology and parasitology laboratories, while a husbandry research section is being developed rapidly on adjacent Departmental property. Facilities are being provided for research into problems associated with cattle, sheep, pigs and poultry; a modern pig testing station is in course of construction.

The Biochemical Laboratory has been transferred from the Division of Plant Industry and is now a constituent part of the Animal Research Institute.

A sheep research station has been established at "Toorak" in the north-west; a cattle research station at "Brian Pastures" near Gayndah, and facilities for animal husbandry research at five Regional Experiment Stations, are further notable additions. An Animal Health Station near Townsville provides facilities for research as well as a diagnostic service for North Queensland.

The three husbandry Branches and the Veterinary Services Branch have been provided with facilities to carry out field research in association with their extension activities.

One of the difficulties of a complete science service is the full integration of the research and extension services. Research services should be kept fully aware of industry problems by contact with industry through the extension services; the extension services require close and continuous contact with research findings. The approach to this question has been to set up liaison and advisory technical committees for each Branch of the Division, the committees comprising representatives of administration, research, extension, and (to ensure proper planning of all investigations) the Biometrics Section.

It would be manifestly impracticable, in a report of this nature, to list the research achievements of the Division of Animal Industry during the post-war period. However, the following will suffice to indicate the volume and breadth of such research:

The causal agents of no less than 20 important diseases of livestock have been determined.

Most of the important "poison plant" diseases have been traced to their sources.

Current advances in the knowledge of cause and development of infertility diseases of stock are probably greater than elsewhere in Australia.

A sound improved system of immunisation of cattle against tick fever has been developed.

A number of mineral deficiency problems have been solved.

The fluorosis problem in sheep has been fully worked out.

Important advances have been made in studies of climate in relation to the growth and reproduction of sheep. Evidence of strain adaptability for the tropics is being accumulated.

Work on vitamin A deficiency in poultry has indicated remedial measures applicable locally.

Drought feeding of cattle, a hitherto neglected subject, has been studied and practical results from this research are being developed.

The State Departments of Agriculture have never been accorded proper appreciation of the research work which they have carried out in agriculture, using the term in its broad sense of primary production. Yet, between them, they have carried out far more agricultural research than all other organisations in Australia put together.

A Department of Agriculture works under a disability as far as popular appeal is concerned. All primary production problems are its field; any primary producer may call on it ; it cannot pick and choose. With limited staff, and endless problems, it obviously must give many problems inadequate attention; a man must frequently be changed from one problem to another, and in such circumstances results with particular problems may be small or but slowly attained.

The purely research organisations, on the other hand, are in a position to pick and choose their problems—and they would not be human if they did not favour those which clearly promise results. They are not under the same day-to-day pressure. They therefore get a reputation for achieving a much higher proportion of successes.

Too little importance is attached to the vast quantity of data continuously accumulated by Departments of Agriculture in their diagnostic and testing services. Data of this type frequently provide the foundation on which later research is built.

SUGAR.

The production of 94 net titre sugar during the 1956 season reached a total of 1,171,870 tons. Although it did not greatly exceed the aggregate mill peaks of 1,170,900 tons the result was somewhat better than had been anticipated earlier in the season. The sugar was manufactured from 8,978,081 tons of sugar cane harvested from 360,952 acres of land.

The average price received for all sugar rose by £4 4s. 1d. above the 1955 price to give the record figure of £46 10s. 6d. per ton and an aggregate value of £54,506,260 for the whole crop (excluding local sales of 361 tons). A total of 673,742 tons was exported for an average value of £41 6s. 5d. per ton.

The record price for sugar was brought about in part by the marked increase in world prices, an increase of £1 8s. 4d. stg. per ton for 1957 "negotiated price quota" sugar in terms of the British Commonwealth Sugar Agreement, and an increase in the domestic retail price of 1d. per lb. granted by the Commonwealth Government in May, 1956.

As a result of severe drought conditions in southern Queensland the local crop is expected to be halved, but with good conditions from Mackay north the 1957 State crop is expected to be 1,195,700 tons of 94 n.t. sugar.

The post-war expansion of the industry has now slowed down and the industry is going through a period of consolidation. Mills are now balancing their plants and restoring full efficiency.

An important milestone in the history of the sugar industry has been passed by the completion of the Mackay bulk handling terminal. It is also expected that the Lucinda Point and Bundaberg installations will be ready for the 1958 season's sugar shipments.

Overseas the main developments of direct interest to Australia were the amendment of the International Sugar Agreement, the annual meeting in London of British Commonwealth sugar exporters, the phenomenal rise in world market values, and the Japanese trade agreement.

The International Sugar Agreement, amended in Geneva in November, 1956, became effective as from January 1st, 1957. Export and import quotas were adjusted; the British Commonwealth quota for 1957 remains at the 1956 figure of 2,450,000 long tons (2,375,000 in 1955) but moves to 2,500,000 tons in 1958. The floor and ceiling prices of 3.25 cents and 4.35 cents per lb. in the 1953 Agreement have been changed to a four-stage price structure for the progressive adjustments of quotas, viz. 3.15, 3.25, 3.45 and 4.00 cents.

World prices stood at 3.25 cents at the time of signing the Agreement. Under the influence of droughty conditions in the Caribbean, and overwet conditions in Europe, the price then rose rapidly, reaching 5.10 cents on January 3rd, 1957, and a peak of 6.85 cents; it had eased to 6.15 cents at the end of June and has since dropped towards 4 cents.

The negotiations between Commonwealth exporters and the United Kingdom Government in November, 1956, resulted in a rise of £1 5s. 8d. stg. in the price of 1957 "negotiated price sugar" and an extension of the term of the Agreement for a further year to 31-12-1964. New Zealand withdrew from the Agreement, thus reducing Australia's quota from 314,000 tons to 300,000 tons. However, New Zealand has since been unfortunate in that world prices have been above Agreement prices.

The Commonwealth trade treaty with Japan provides opportunity for the selling of Australian sugar in that country. However, any such sales will take place within the framework of the British Commonwealth Sugar Agreement and will not increase Australia's quota. The loss of British preference on such sales as have been made is balanced by reduced freights.

THE GRAIN INDUSTRIES.

Grain production has approximately doubled in Queensland during the post-war period. Whilst the growing of winter grains in a predominantly summer rainfall area carries some hazards, the increasing appreciation of the role of soil-stored moisture has helped to smooth out the troughs in production. This factor has helped to keep Queensland at the top of the Australian score card in respect of yields per acre.

Wheat, the major grain, fell away during the past season. Due partly to an excessively wet autumn and early winter precluding planting in some areas, and due partly to the counsel of industry leaders to divert to other grains, only 390,000 acres was planted in 1956. In spite of the fact that little effective rain fell during the remainder of the season, and heavy late frosts were experienced in October, the estimated harvest of 8 million bushels represents a yield of over 20 bushels per acre.

As a result of this relative failure of the wheat crop the export wheat market could not be availed of, while exports of flour had to be cut severely. The possible resulting loss of export markets could be serious. To meet the deficiency in feed wheat 723,000 bushels was imported from southern States at an additional cost of 4s. 6d. per bushel ex store.

Wheat is the only grain subject to a national stabilisation plan; there is never any surplus post-season carry-over of Queensland wheat; and there is a ready export market for high-protein Queensland wheat. Advice to recede from wheat growing in Queensland on account of market prospects would therefore appear to be particularly unsound.

Quite apart from these aspects, the guarantees given under the Wheat Agreement carry an implied obligation on the wheat grower to produce the wheat where it is wanted and when it is wanted. Industry leaders would do well to ponder this aspect. The planting of 390,000 acres of wheat in 1956 compares very unfavourably with the plantings of 687,402 acres and 581,732 acres in 1954 and 1955 respectively.

A bulk loading plant for wheat, with a capacity of 1·3 million bushels, is approaching completion at Pinkenba and will be ready for the 1958 crop.

The yield of barley for the 1956 season is estimated at 3,900,000 bushels, a decrease of only some 10 per cent. on 1955 figures. Production of this commodity is now ten times that of the 1944-1948 period. The greater part of the crop is now exported and there appears to be a steady, reasonably attractive, export market.

Maize is perhaps declining somewhat from its level of about three million bushels. Grain sorghum production has also stabilised around four million bushels. Both these grains should be more widely used in animal production than they are.

Canary seed has had a spectacular rise from 30,000 bushels in 1953 to over one million bushels in 1956. Undoubtedly this grain has advanced at the expense of wheat, due to high prices following successive failures of the North African crop. The Marketing Division of this Department had warned that the attractive export market was unstable; the truth of this prediction is borne out by the fact that current prices are about half those of last year and much of last season's crop remains unsold.

Linseed has become an important crop under the contract purchase scheme operated by oil mills. Production in 1956 was three-quarters of a million bushels but would have reached one million bushels in a normal season. The stability of this industry is contingent upon the maintenance of a contract system with remunerative prices. However, the profitable market is limited to domestic consumption and production is fast approaching that figure.

The Department's periodical reports on grain markets and sales prospects are becoming widely appreciated. In response to industry requests the reports on the main grains have been extended to include canary seed, linseed, white French millet and panicum.

The Seed Certification service, whereby seed is grown under Departmental supervision and sold in sealed packages, is expanding rapidly as the demand is created. Demand is particularly high in the grain industries. Certification of wheat is undertaken in conjunction with the State Wheat Board. It is estimated that two-thirds of the hybrid maize crop and nine-tenths of the sorghum crop are grown from certified seed or its immediate progeny. This growing practice promotes higher yield and greater uniformity of product.

HORTICULTURE.

The weather conditions did not favour horticultural crops in most areas. Current prospects are not good, especially in the Redlands "salad bowl" area, which is dependent upon locally-absorbed water for irrigation from underground sources. An interesting development in this area is the rapidly increasing "water harvesting" on the less porous soil types.

Nevertheless the apple (809,000 bushels) and pear (50,000 bushels) crops set records, while the 116,000 bushels of Stanthorpe grapes represented a record for the main producing area

Pineapple production for the year is expected to be less than 2,700,000 tropical cases, a decline of 200,000 cases from the previous year and well below normal. Supplies received at the canneries have at times been insufficient to meet the demand for some lines, including pineapple juice.

In order to stimulate pineapple production in North Queensland the Government has, subject to certain conditions, offered to guarantee a loan of £250,000 for capital expenditure on the building of a cannery at Cairns, and to guarantee a further loan of £250,000 for working expenses. The Committee of Direction of Fruit Marketing has undertaken to commence building operations when local production of pineapples for canning reaches 4,000 tons. In the meantime northern pineapples, surplus to fresh fruit market requirements, are being canned at Koongal or Northgate.

The exacting climatic conditions in Queensland create particular difficulties in the storage and transport of fruit and vegetables. Many of our products, too, are exotic by temperate zone standards and consequently suitable methods of preservation have not always been developed elsewhere. Additional research on the problems of transport, storage, and preservation of Queensland fruit and vegetables is therefore a pressing necessity. The Government has recently voted £114,000 for the erection of a suitable laboratory in proximity to the cold stores at Hamilton.

At the request of the C.O.D. a preliminary economic survey of the pineapple industry has been carried out and a programme laid down for the collection of data necessary to make the survey a continuing one. One of the serious problems confronting the pineapple industry, and to a less extent other horticultural industries, is the whittling down of size of farms. Under pressure of scarcity of labour, or attractive offers in times of high prices, farmers have subdivided their properties.

Whilst small farms may be profitable in an era of high prices the story is different when prices fall. Moreover, the small farm has insufficient land for the rotation or spelling which is so essential after a few years. This "fragmentation" is a concomitant of unrestricted freehold and has provided an acute problem in the old world. Western Europe has for many years had special Commissions to deal with it.

SHEEP AND WOOL.

The number of sheep increased by over one million to reach the total of 23,240,000. This is the greatest number recorded since 1943 and represents an increase of seven millions since 1951. During the year 786,540 bales of wool were sold for approximately £83 millions, which is the second highest total yet recorded. The earnings of wool were therefore nearly £30 millions in excess of sugar, its nearest competitor in industry earnings. However, the sales of wool do not give a true picture of production since the carry-over caused by the previous year's strike inflated offerings.

As the gap between costs and returns narrows, and with the higher capital investment in post-war purchases of properties, sheep men have

found it necessary to build up their flocks. Aided also by good seasons flocks have progressively increased each year since 1951.

At the same time there is a growing interest in improved methods of husbandry. One of the economic essentials of this industry is to reduce the periodic calamitous stock losses during severe droughts, which have been a feature of the past. Recovery of flock numbers has usually been slow and costly. With better appreciation of the role of soil-stored moisture in crop production it becomes feasible to grow crops for silage in areas of "non-agricultural" rainfall. Interest is growing in such means of avoiding crippling drought losses.

Slightly in excess of 150,000 lambs were slaughtered. Although this is the highest total for many years it is only 1 per cent. of the output of New Zealand, a country one-sixth the size of Queensland. Obviously there is great room for further development of a fat lamb industry. In order to study fat lamb production Mr. C. R. Smith, Senior Adviser in Sheep and Wool, paid a visit to New Zealand early in 1957.

Difficulties in sheep management peculiar to the tropical and near-tropical environment are being studied at the Toorak Field Station in the north-west. Of perhaps particular interest at this juncture is an investigation into the possibility of selecting strains of Merinos which will produce better, and reproduce better, in the tropics.

In 1955, five-year-old ewes selected for established breeding performance produced 80 per cent. of lambs marked to ewes mated. This compares with a 60 per cent. marking for the Station flock and a 49 per cent. State average.

This experiment was repeated in 1956 with young ewes divided into four classes, the selected two-year-old ewes being selected on the basis of wool cut. The results supported the previous year's findings and suggest that reproductive capacity is associated with productive capacity. These trials give a promising lead for selection of locally adapted strains.

Difficulty of recruiting and maintaining staff was again experienced and the important centres of Longreach, Barcaldine, and Blackall were unstaffed.

DAIRYING.

The unfavourable seasonal conditions are reflected in production statistics. The number of dairy cattle declined by about 1,500 and dairy production (see Table 2) fell by rather more than 10 per cent. Australian production of butter was high (at about 205,000 tons) as also was the case in New Zealand. These factors contributed to the fall in export prices (see page 113) on the London market, the price ruling at the end of March, 1957, being the lowest for several years. Fortunately, London prices recovered with better regulation of deliveries. The cheese market followed a similar pattern.

The new Commonwealth Stabilisation Scheme now permits the Australian Dairy Produce Board to employ its funds on sales promotion and research and action along these lines can be expected. There is still room for much improvement in both level and uniformity of quality. During the year 74 per cent. of butter produced in Queensland was officially graded: 34 per cent. was graded choice, 54 per cent. first grade and 12 per cent. second and pastry grades.

Whilst conceding that the climate of Queensland increases the difficulties of producing high quality butter and cheese, it cannot yet be said that the problem has been squarely faced. A basic step in quality improvement is the establishment of adequate price differentials for quality in milk and cream. Silk purses cannot be made out of sows' ears and all the modern equipment available will not make good butter or cheese from poor cream and milk.

At the same time it must be recorded that dairymen themselves are showing a creditable and increasing interest in scientific aids to production. In spite of the curtailment of travelling imposed by financial restrictions, some 23,000 farm visits were paid by officers of the Field Services Branch—exclusive of visits from officers of the Agriculture, Cattle Husbandry, and Veterinary Services Branches. In addition, 9,400 farmers attended 48 demonstrations, 20 field days, 30 film evenings, 54 talks to Junior Farmers' Clubs, 18 Herd Testing Group annual meetings, and other meetings.

Naturally there are many duplicated attendances at these meetings but obviously a high proportion of the 22,000 dairy farmers must be seeking technical guidance.

From 18 months' experience with the experimental Dairy Extension Advisory Committees set up in 1955 it was evident that such Committees provided an effective liaison between science and industry and could greatly stimulate farmer interest. In the light of this experience it was decided to develop the project further and establish Advisory Committees on the basis of the constituent Districts of the Queensland Dairymen's Organisation.

The development of the herd recording project suffered a setback as a result of droughty conditions, many herds having to drop out as a result of poor yield.

Recorded herds show a progressive increase in yield per cow. One Atherton farm, in the scheme for eight years, has recorded an increase from 182 lb. butterfat per cow to 348 lb. The yield per cow in the experimental herd on the Kairi Regional Experiment Station has increased from 167 lb. to 267 lb. in 7 years. This herd was purchased as an average district herd and has been built up by culling and testing, while being fed only farm-grown feed, other than a small supplement during first lactation of heifers. No farmer can manage his herd to the best advantage without knowing what his cows are producing and such knowledge can come only from herd recording. Systematic herd recording is not just mere collection of statistics In addition to auditing each herd's performance it yields a tremendous amount of information on sire performance, effect of time of calving, and so on.

Infertility in dairy herds is a serious economic factor reducing profitable sales of surplus stock and forcing purchase in the saleyards, in addition to reducing output. A nation-wide attack on this problem has been organised by veterinarians and useful progress is being made in Queensland investigations.

Artificial insemination can be an important factor in controlling dairy herd diseases such as infertility. Indeed, it is probable that this will be its most important contribution in this country, where herds are large. A centre for research and semen collection has been set up at the Animal Husbandry Research Farm and an experimental A.I. centre has been started on the Atherton Tableland. A bull-proving project was started in the Jersey breed two years ago and this will be extended to A.I.S. in the coming year.

The formulation of a policy for A.I. in Queensland is now under consideration. Based on overseas experience, and bearing in mind the special conditions obtaining here, it would appear desirable for the Department to collect and distribute semen to field centres, but for the operation of the field centres to be undertaken by the industry.

T.B. testing of dairy herds has been fully maintained with 41 veterinarians in residential private practice holding testing contracts. Nearly 460,000 dairy cattle were tested during the year.

Surveys carried out by the Bureau of Agricultural Economics indicate that cost of production of milk in Queensland is above the Australian average. This is due in part to less favourable climatic conditions, and the main problem of the industry is to adjust and compensate the unfavourable factors upon an economic basis. Upon the return of Mr. C. H. P. Defries from abroad it is proposed to initiate an examination of the relative cost structure of the industry.

It is evident that the dairy industry must strive to become less dependent upon butter. This can be done by increasing sales of whole-milk, fresh cream, and cheese, the consumption of each of which is well below desirable levels. The consumption of cheese is only two ounces per person per week and, for the most part only cheddar cheese is manufactured. The Dairy Research Laboratory is presently giving particular attention to the manufacture of fancy cheeses.

BEEF INDUSTRY.

The number of beef cattle in the State was computed to be 6,113,000 as at March 31st, 1957. This number falls short of the 1921 record by only 100,000 and is an increase of nearly 1·5 millions over the figures for the immediate pre-war and post-war quinquennia. The increase from 1956 was approximately 3 per cent.

The computed production of beef and veal for the period was 313,367 tons, an increase of some 7 per cent. over 1956, whilst slaughterings increased by some 112,000 to 1,614,023.

The beef industry has thus continued the post-war trend of a rising percentage of animals slaughtered (thus indicating slaughter at an earlier age) and a greater weight of beef produced per animal depastured. Referring again to the immediate post-war and pre-war quinquennia, whilst the numbers of beef cattle have increased by about 30 per cent., slaughterings have increased by nearly 60 per cent. and beef and veal production by about 70 per cent.

The record of this industry compares more than favourably with most other industries. It is unfortunate that the rising production and quality have to contend with unfavourable meat export market conditions (see page 113).

The type of carcase now sought is lighter and carries less fat than in the period of bulk buying by the United Kingdom Government. There is a strong demand for cattle of less than three years of age and dressing out at 550-650 lb. During the year buyers for the meat exporters have introduced differential prices for younger, lighter cattle.

During the year ended June 30th, 1957, approximately 10,000 live cattle were exported to the Philippines from North Queensland. The cattle were mainly of the larger type not now favoured here. This new and growing export business could represent an important economic gain to the beef industry.

The lighter, younger, type of cattle now sought by the United Kingdom and southern markets require a series of good seasons for production on native pastures. Since runs of good seasons are the exception rather than the rule, the investigational work being carried out by the Cattle Husbandry and Agriculture Branches aims at raising the nutritional plane. In a considerable degree this is the first time that systematic research work of this nature has been carried out under tropical and near-tropical conditions.

Weighing machines have been installed at 15 centres in the coastal cattle areas of the State. The same picture is presented at all the centres where cattle were grazed on "natural" pastures (see Figs. 1-3, p. 83). Even in good seasons cattle gain weight for four months, then lose weight for four months during the winter, and spend the next four months getting back to where they were. This means an average net growing season of four months with an average net liveweight gain of 270-300 lb. per year, which is insufficient to produce a carcase of 550-600 lb. dressed weight at less than four years of age.

On rain-grown improved pastures at the South Johnstone and "Brian Pastures" stations, and on irrigated pastures at Ayr, liveweight gains of 400-500 lb. have been recorded and practically all the carcases have been graded "baby beef" or first grade. Without question the adoption of large-scale pasture improvement is necessary to maintain our place in the overseas beef market.

Continuous tests being carried out at three centres in or adjacent to the tropics indicate that at about 3½ years cattle carrying a suitable percentage of *Bos indicus*, or Indian cattle, blood will dress out at 100 lb. above the pure British breeds. However, there is probably room for considerable improvement by selection within the

British breeds under tropical conditions and investigations are also proceeding along these lines.

With a view to improving the classing of beef herds a method of "scoring" young animals is being studied and developed at "Brian Pastures". Full weight, measurement, and grading checks on the scored animals and their progeny are being maintained.

ITEMS IN BRIEF.

The recently appointed Director of the Division of Plant Industry (Mr. W. G. Wells) has taken the opportunity to review the activities of his Division since its formation in 1945. A reading of this review (pp. 14-21) will be found interesting and informative.

Most of the Darling Downs soils, after 50 to 100 years of cultivation, have failed to show any economic response to applications of fertilizer. However, certain "problem" areas are now developing and the area between Pittsworth and Millmerran is now producing wheat consistently low in protein. Trials have indicated improved yields and quality following applications of nitrogenous fertilizers. Some areas have also reached the stage where they cannot sustain "feeding off" young cereal crops without supplementary nitrogen.

Agrostologists have been stationed in the Central Highlands and at Cloncurry with the object of improving the pasturage on pastoral properties. The nutritional life of pastures is being prolonged by the use of the new grasses and legumes introduced into Australia from overseas. An almost entirely unexplored field is breeding and selection within our native grasses, but this important phrase of work cannot be undertaken without expansion of staff. It is of interest to note that the famous King Ranch in Texas is almost entirely pastured with developed strains of local grasses.

Some 70,000 acres of grassland was sown from the air during 1956-57 but the season was not conducive to good results. A promising method of spreading improved grasses in pastoral districts is the sowing of "islands" with the object of natural spread into adjoining areas. The seeding of fire-plough strips is being widely practised.

Following the succession of relatively mild winters the cattle tick has spread beyond the recognised normal limits, causing some difficulties to owners of beef and dairy cattle. It is expected that there will be a recession during the current dry period. Due to the development of resistant strains of ticks the work of testing new tickicides must be continuous.

Among recent developments have been two DDT preparations which are miscible in hard waters. Treatment with new tickicides shows promise of drastically reducing the time period between dippings on entry of cattle into "clean" areas; if the promise is sustained the economic results will be very considerable.

Whilst a great deal of research work has been done on the drought feeding of sheep, little systematic work has been done on cattle. This has now been made a major project within the Animal Research Institute. Promising results are being obtained from the feeding of bush hay with or without additives. Cattle rapidly lose weight on dry natural pastures in the winter months and mortality is heavy in drought periods. Moreover, they will not readily eat bush hay made from native grasses and will walk themselves poor seeking "picking".

The progress research results indicate that the cattle must be confined in drought time to conserve energy and given no choice of ration. Under these conditions they lose weight only very slowly when fed bush hay alone, and can make appreciable weight gains when fed small quantities of additives (see pp. 77 and 78).

Research into tick fever has been intensified at both Yeerongpilly and Oonoonba Stations, and five senior officers are participating. Aspects being investigated include seasonal carryover of the disease, reciprocal infectivity between cattle and tick; transmission of resistance or immunity from dam to progeny; and chemotherapy by injection.

An experiment of interest and future significance to maize growers was carried out at the Kairi Regional Station. Sixteen acres of cyclone-damaged maize, impracticable of harvest, was grazed to pigs. Apart from a protein supplement they received no other food. The 50 store pigs averaged 67 lb. liveweight and were purchased for £289; the cost of protein supplement was £60 12s. 11d., making the total outlay £349 12s. 11d. The estimated value of the maize (could it have been harvested) was £134 5s. 0d. Upon completion of the trial the pigs were sold to the local bacon factory for £682 6s. 7d., giving an additional gross profit of £332 13s. 8d. The success of this experiment underlines the advantages of grazing, crop harvesting, and less wasteful usage of skim-milk in the pig industry.

The Biochemical Laboratory has attacked two problems of particular interest to the Queensland animal industries—mineral deficiencies and vitamin deficiencies. Silage is receiving special attention. It is not enough to produce silage which looks good and smells agreeable; digestibility and vitamin content must be preserved and the relevant factors are being studied with silage made under varied conditions and with varying components.

Chemistry is the handmaiden of a great deal of agricultural research and great improvements have been made in the application of chemistry to agriculture and also in chemical apparatus. The burette and the crucible are being relegated to the background. New methods and new apparatus, requiring a high degree of skill for their application, have increased the use and importance of chemistry. The use of radioactive isotopes is a powerful tool in solution of plant nutrition problems; chromotography and spectrophotometry have come to aid in separation and analysis of complex organic compounds such as the new insecticides. Electrophoresis is being applied to the study of wheat protein.

STAFF AND ORGANISATION CHANGES.

A considerable degree of change in staff dispositions followed retirement and resignation of senior officers.

Mr. Robert Veitch retired on December 31st., 1956. Mr. Veitch had served in the Department for 31½ years, commencing as Chief Entomologist and retiring as Assistant Under Secretary (Technical). To Mr. Veitch goes a great deal of the credit for commencing and guiding a policy of recruiting more highly trained personnel for the science sections. Promotions consequent upon the retirement of Mr. Veitch were Dr. W. A. T. Summerville (Assistant Under Secretary (Technical)); Mr. W. G. Wells (Director, Division of Plant Industry); Mr. W. J. Cartmill (Director of Regional Experiment Stations); and Mr. J. E. Ladewig (Chief Soil Conservationist).

Following a long-range plan the small Pig and Poultry Branches were combined and placed under the Directorship of Mr. A. L. Clay. The combined Branch now has equal status with other Branches and so recruitment and promotion are stabilised.

The resignation of Dr. G. R. Moule, Director of Sheep Husbandry and also Extension Co-ordinator, caused a serious loss. His energy and enthusiasm had built up an efficient service for our most important primary industry, as well as laying the foundation for an extension training and co-ordinating service. He has been succeeded as Director of Sheep Husbandry by Mr. A. T. Bell. The Extension Section has been somewhat reorganised with Mr. H. Barnes assuming control of administration and Mr. C. W. Winders in charge of extension matters.

Mr. A. A. Ross was appointed Standards Officer consequent upon the death of Mr. F. B. Coleman, an able and conscientious officer who had filled the position since its inception.

Following the retirement of Dr. J. Legg, Mr. L. G. Newton has been appointed Director of the Pathological Laboratory within the Animal Research Institute. Dr. Legg's research work, particularly on the cattle tick problem, has been of very great importance.

The policy of encouraging overseas visits was continued:

The Director of the Division of Dairying (Mr. E. B. Rice) attended the International Dairy Congress held in Rome during September, 1956; he also visited the United States, the United Kingdom, and Western Europe.

Messrs. S. Marriott and G. R. Lee attended the International Grasslands Congress in New Zealand and later visited various parts of the Dominion.

Mr. C. H. P. Defries (Assistant Director of Marketing) was awarded a Leader Specialist Grant by the United States Government for the purpose of studying farm management and farm economy. He will stay in the United States for some four months and on his return will initiate a series of industry surveys.

Mr. W. J. S. Sloan, Director of Agriculture, was awarded a Rockefeller Travel Grant and will spend some seven months investigating agricultural practices in the United States.

Mr. W. A. Smith is also in the United States on an entomological mission on behalf of the Biological Section of the Department of Public Lands. His particular objective is parasitic control of the Noogoora burr.

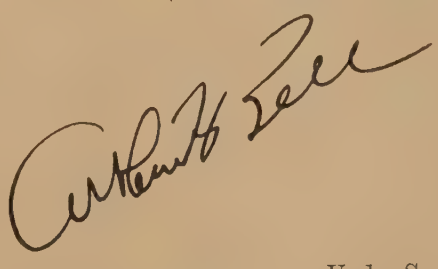
It is expected that Messrs. J. R. Wolfe and R. C. Menary will proceed to the United States in September in order to study extension methods and horticulture respectively. They will attend the Universities of Cornell and California respectively for an academic year.

As the present organisation of the Department was drafted twelve years ago it was considered desirable to re-examine it in the light of changed circumstances. A special Committee, consisting of an Inspector of the Public Service Commissioner's Department, the Assistant Under Secretary (Technical), and the Director of the Division of Animal Industry, has reported that no structural changes in the basic organisation appear to be necessary.

ACKNOWLEDGMENTS.

Thanks are again due to numerous producers' organisations, business houses associated with primary production, individual primary producers, the press, and broadcasting stations for their co-operation and encouragement over a very wide field. Commonwealth and State Departments (both in Queensland and in other States) have generously responded to our many calls; here it would not be invidious to make special mention of the Queensland Government Statistician and the Commonwealth Meteorological Bureau.

Yours faithfully,



Under Secretary.

11th September, 1957.

TABLE 1.

RAINFALL DATA—QUEENSLAND.

(Source—Commonwealth Bureau of Meteorology).

District.	Rainfall—July, 1955 to June, 1956.	Rainfall—July, 1956 to June, 1957.	Average Annual.
	Points.	Points.	Points.
Peninsula North	5,399	6,556	5,838
Peninsula South	4,743	5,043	3,605
Lower Carpentaria	2,834	3,517	2,420
Upper Carpentaria	3,824	3,404	2,404
North Coast (Barron)	6,895	8,230	6,255
North Coast (Herbert)	8,454	9,653	7,233
Central Coast (East)	5,429	3,721	3,694
Central Coast (West)	2,931	2,422	2,366
Central Highlands	3,942	2,614	2,318
Central Lowlands	2,746	2,282	1,754
Upper Western	1,794	2,210	1,430
Lower Western	1,764	1,186	911
South Coast (Curtis)	5,599	2,986	3,640
South Coast (Moreton)	6,717	2,966	4,272
Darling Downs (East)	4,288	2,212	2,599
Darling Downs (West)	3,903	1,859	2,130
Maranoa	3,533	1,952	2,066
Warrego	3,490	1,680	1,621
Far South-West	2,346	1,229	1,121

TABLE 2.

PASTORAL AND DAIRYING STATISTICS.

(Source—Queensland Government Statistician and Commonwealth Statistician).

——	Average 1934–35 to 1938–39.	Average 1944–45 to 1948–49.	1952–53.	1953–54.	1954–55.	1955–56.	1956–57. (a)
Beef Cattle (number)	4,631,482	4,797,681	5,378,397	5,702,999	5,860,848	5,946,282	6,113,000
Cattle and Calves slaughtered (number) (b)	1,046,111	1,019,621	1,272,585	1,366,273	1,430,096	1,502,284	1,614,023
Beef and Veal produced (tons)	180,717	186,354	252,495	257,783	271,550	291,532	313,367
Dairy Cattle (number)	1,387,011	1,417,892	1,372,998	1,383,208	1,377,214	1,383,739	1,382,000
Total Milk produced for all purposes (,000 gallons)	278,227	255,810	285,533	249,712	275,605	282,443	253,000
Butter produced (tons)	54,722	43,453	49,425	42,154	46,223	48,541	41,000
Cheese produced (tons)	5,077	9,778	9,439	6,746	7,921	7,580	7,000
Sheep (number)	21,060,513	17,912,361	17,029,623	18,193,988	20,221,826	22,115,746	23,240,000
Wool production (,000 lb.)	164,971	161,401	163,149	174,414	176,548	186,406	231,500
Sheep slaughtered (number) (b)	1,029,054	1,201,301	953,838	964,006	913,485	1,059,370	1,063,921
Mutton produced (tons)	19,192	20,712	18,572	18,075	17,254	21,215	20,388
Lambs slaughtered (number) (b)	72,178	111,111	121,781	116,898	95,662	126,439	154,736
Lamb produced (tons)	974	1,568	1,799	1,617	1,296	1,805	2,261
Pigs (number)	294,776	395,814	335,809	384,453	406,879	372,871	390,000
Pigs slaughtered for Pork (number) (b)	260,928	155,897	115,091	129,447	159,744	(a) 149,606	139,309
Pigs slaughtered for Bacon and Ham (number) (b)	264,306	308,930	285,326	329,727	326,316	(a) 301,936	306,477
Pork produced (tons)	9,867	9,202	6,548	7,132	8,370	(a) 7,708	7,018
Bacon and Ham produced (tons)	9,269	10,707	9,510	10,616	10,805	(a) 10,217	9,965

(a) Preliminary figures. (b) Slaughtered for human consumption.

TABLE 3.

Agricultural and Horticultural Statistics.

(Source—Queensland Government Statistician.)

——	Average 1934–35 to 1938–39.	Average 1944–45 to 1948–49.	1952–53.	1953–54.	1954–55.	1955–56.	1956–57 (*a*).
Sugar Cane (*b*)—							
Cut for crushing (acres)	247,092	244,554	274,757	332,703	367,640	365,252	361,000
Cane production (tons)	5,181,124	5,073,804	6,841,036	8,751,536	9,864,304	8,616,163	8,978,000
Yield per acre (tons)	20·9	20·7	24·9	26·3	26·8	23·6	24·9
Sugar manufactured (tons)	757,560	707,144	934,614	1,220,383	1,301,245	1,135,685	1,171,870
Wheat—							
Area (acres)	340,055	408,570	724,495	579,969	687,402	581,732	390,000
Production (bushels)	4,766,927	8,175,054	18,662,391	10,180,368	16,477,770	14,921,913	8,000,000
Yield per acre (bushels)	14·0	20·0	25·8	17·6	24·0	25·7	20·5
Maize—							
Area (acres)	174,628	132,280	108,230	114,735	114,673	108,146	107,000
Production (bushels)	3,271,919	3,119,961	2,650,365	3,041,607	3,079,692	2,710,107	2,750,000
Yield per acre (bushels)	18·7	23·6	24·5	26·5	26·9	25·0	25·7
Barley—							
Area (acres)	9,777	18,043	71,879	56,076	87,297	145,526	150,000
Production (bushels)	153,028	392,609	2,108,979	1,138,839	2,572,902	4,216,044	3,900,000
Yield per acre (bushels)	15·7	21·8	29·3	20·3	29·5	29·0	26·0
Oats—							
Area (acres)	8,542	23·690	56,403	13,480	36,432	35,638	24,000
Production (bushels)	102,819	419,350	1,302,528	199,026	597,087	742,950	360,000
Yield per acre (bushels)	12·0	17·7	23·1	14·8	16·4	20·8	15·0
Canary Seed—							
Area (acres)	19,233	11,604	21,124	4,104	23,294	73,469	100,000
Production (bushels)	91,616	101,708	339,136	29,427	377,706	894,633	1,008,000
Yield per acre (bushels)	4·8	8·7	16·1	7·2	16·2	12·2	10·1
Millet, Panicum and Setaria—							
Area (acres)	(*c*)	21,661	19,461	39,382	45,842	49,508	60,000
Production (bushels)	(*c*)	279,521	211,089	556,401	802,806	746,679	750,000
Yield per acre (bushels)	(*c*)	12·9	12·8	14·1	17·5	15·1	12·5
Sorghum—							
Area (acres)	(*c*)	67,405	190,619	181,819	202,532	155,527	160,000
Production (bushels)	(*c*)	1,511,831	3,239,133	4,039,779	5,082,762	3,960,195	3,750,000
Yield per acre (bushels)	(*c*)	22·4	17·0	22·2	25·1	25·5	23·4
Lucerne Hay—							
Area (acres)	50,600	43,942	45,806	51,626	58,133	49,946	46,000
Production (tons)	84,808	93,005	106,618	113,640	145,732	116,629	105,000
Yield per acre (tons)	1·7	2·1	2·3	2·2	2·5	2·3	2·3
Wheaten Hay—							
Area (acres)	5,388	9,723	8,284	6,279	5,538	5,197	(*e*)
Production (tons)	5,379	10,006	11,476	8,785	8,022	8,442	(*e*)
Yield per acre (tons)	1·0	1·0	1·4	1·4	1·4	1·6	(*e*)
Arrowroot—							
Area (acres)	888	614	356	348	372	338	350
Production (tons)	9,456	6,956	4,054	2,852	4,114	3,698	3,500
Yield per acre (tons)	10·65	11·33	11·39	8·19	11·06	10·94	10·0
Cotton—							
Area (acres)	55,504	9,541	5,866	8,965	8,377	13,290	11,000
Production (lb.)	16,598,485	3,447,003	2,184,268	5,132,145	3,597,207	5,359,217	3,936,000
Yield per acre (lb.)	299	361	372	572	429	403	358
Linseed—							
Area (acres)	..	(*d*)	25,875	3,647	15,569	45,202	100,000
Production (bushels)	..	(*d*)	269,244	15,492	202,664	526,075	756,000
Yield per acre (bushels)	..	(*d*)	10·40	4·25	13·02	11·64	7·6
Peanuts—							
Area (acres)	14,532	28,375	18,920	36,617	37,971	31,493	25,000
Production (lb.)	13,641,059	32,258,355	18,901,157	40,020,438	31,362,224	19,338,263	20,160,000
Yield per acre (lb.)	938	1,137	999	1,093	826	614	806
Potatoes—							
Area (acres)	12,144	13,155	11,641	9,382	9,621	10,202	11,000
Production (tons)	20,929	29,332	35,051	32,628	30,651	37,561	36,500
Yield per acre (tons)	1·7	2·2	3·0	3·5	3·2	3·7	3·3
Pumpkins—							
Area (acres)	21,829	35,778	28,016	25,231	22,097	22,747	22,000
Production (tons)	52,248	81,063	69,464	65,858	56,019	50,819	44,000
Yield per acre (tons)	2·4	2·3	2·5	2·6	2·5	2·2	2·0
Tobacco—							
Area (acres)	3,659	1,921	4,339	4,065	5,135	6,301	7,300
Production (lb.)	2,033,736	1,580,365	3,431,300	4,015,000	4,331,595	3,702,227	4,744,000
Yield per acre (lb.)	556	823	791	988	844	588	650
Apples—							
Area (acres) (bearing)	3,320	4,583	4,965	5,090	5,590	5,661	6,000
Production (bushels)	252,756	369,892	204,754	499,699	592,300	733,543	810,000
Yield per acre (bushels)	76	81	41	98	106	130	135
Bananas—							
Area (acres) (bearing)	6,016	6,022	3,662	4,531	5,452	5,353	5,000
Production (bushels)	651,558	628,515	384,836	532,810	538,650	626,196	501,000
Yield per acre (bushels)	108	104	105	118	99	117	100
Citrus—							
Area (acres) (bearing)	3,303	4,290	4,512	4,572	4,622	4,640	4,600
Production (bushels)	349,180	530,316	431,753	542,057	567,428	653,302	600,000
Yield per acre (bushels)	106	124	96	119	123	141	130
Pineapples—							
Area (acres) (bearing)	4,766	5,479	6,258	7,105	8,355	8,471	8,400
Production (dozens)	1,624,362	1,788,261	2,209,185	2,988,420	3,580,641	4,038,815	2,935,000
Yield per acre (dozens)	341	327	353	421	429	477	349
Beans, French—							
Area (acres)	2,733	5,161	5,205	4,604	4,810	4,831	4,820
Production (bushels)	267,842	444,394	555,168	506,930	517,688	539,569	540,000
Yield per acre (bushels)	98	86	107	110	108	112	112
Onions—							
Area (acres)	1,155	2,273	2,813	2,497	2,807	2,480	2,500
Production (tons)	3,468	10,016	11,542	11,957	12,243	9,157	10,000
Yield per acre (tons)	3·0	4·4	4·1	4·8	4·4	3·7	4·0
Tomatoes—							
Area (acres)	5,137	7,739	5,833	5,058	5,327	5,530	5,400
Production (bushels)	502,171	779,676	732,613	671,300	749,131	682,777	650,000
Yield per acre (bushels)	98	100	126	133	141	123	120

(*a*) Preliminary figures.
(*b*) Sugar figures supplied by Bureau of Sugar Experiment Stations.
(*c*) Very small amounts. Exact figures not available.
(*d*) In 1947–48, 122 acres produced 1,176 bushels, and in 1948–49, 4,139 acres produced 35,019 bushels.
(*e*) Figures not available.

DIVISIONAL DIRECTORS' REPORTS.

DIVISION OF PLANT INDUSTRY.

Director: Mr. W. G. Wells.

The financial year under review witnessed, at Dec. 31, 1956, the retirement of Mr. Robert Veitch, Assistant Under Secretary (Technical), who was succeeded by Dr. W. A. T. Summerville. In view of Mr. Veitch having been the first Director of the Division of Plant Industry—May, 1945 until July 1, 1947—and Dr. Summerville the second Director from then until the end of 1956, it seems fitting to survey the developments and major achievements of the Division over the 12-year period.

Amongst the major developments during the 1945-46 financial year was the establishment of regional experiment stations at Hermitage, Biloela and Kairi to serve respectively the south-eastern, central and northern agricultural districts of the State. Biloela had functioned as a Cotton Research Station since 1924, but Hermitage and Kairi were old State Farms that had been leased during the depression of the 1930's and required much re-organisation. In addition, a 113-acre property was acquired near Nambour for the development of a horticultural experiment station and plans were prepared for resuming horticultural investigations at Kamerunga, near Cairns, following the Army terminating war-time activities there. Operations at the Bureau of Tropical Agriculture, near South Johnstone, were also expanded to embrace a comprehensive programme of testing grasses and legumes of potential value to the animal industries in North Queensland.

The Queensland State Weeds Co-ordination Committee was also established, to serve as a common meeting ground to discuss weeds problems. With Mr. R. Veitch as Chairman, membership consisted of representatives of the Council for Scientific and Industrial Research, the Department of Public Lands and the Department of Agriculture and Stock.

A noteworthy item reported for the 1945 wheat harvest was that Queensland-bred varieties accounted for 80 per cent. of the acreage sown for grain.

An interesting feature of that year was the results obtained from a very comprehensive programme of preliminary entomological investigations of the merits of a relatively new insecticide, DDT.

The 1946-47 financial year witnessed further expansion of facilities for investigational programmes. In addition to continuing the Departmental development of Hermitage, Biloela and Kairi Regional Experiment Stations, the State Government purchased from the Federal Government a property at Ayr which the latter Government had operated as an irrigated vegetable farm during the War. The purpose of this acquisition was, amongst other things, to permit the development of a regional experiment station with facilities to conduct, in co-operation with the C.S.I.R., investigations in beef cattle fattening on irrigated pastures. The work of the Horticulture Branch was also furthered by the purchase of a property in the Redlands district, near Brisbane, for development into a vegetable experiment station with irrigation facilities.

The establishment by the Bureau of Investigation of an Irrigation Research Station on part of the property of the Queensland Agricultural High School and College gave additional facilities for the conduct of irrigation investigations by Divisional officers.

During the year, needed intensification of research into tobacco growing took place, aided in part by a grant from the Commonwealth Government. The programme mostly centred on exploratory plots on a range of potential tobacco soils in the Clare section of the Burdekin River Valley.

A very important event of that year was the inauguration of the seed certification scheme under a Seed Certification Committee. Three sub-committees were appointed under it to deal respectively with hybrid maize, sorghum and beans.

The nucleus of a soil conservation service was instituted and, in association with the Bureau of Investigation, surveys were conducted on the Darling Downs for the purpose of selecting suitable sites for investigational and demonstrational work on soil conservation.

Commencing in July, 1947, the regional experiment stations were consolidated into a Branch of the Division under the control of a Director. Intensification of the development of facilities and broadening of the scope of the investigational programmes on the stations were features of that Branch's activities for the year. The work of the Bureau of Tropical Agriculture was also expanded by the establishment of a sub-station at Utchee Creek to allow problems of pasture and stock management to be studied on a larger scale than was possible at the Bureau.

Tobacco growing problems received increased attention during the year through the establishment of small experiment stations at Mareeba, Clare and Ingham.

Soil conservation services were also intensified by the appointment of three additional officers, but staff was still far below that required to meet the increasing demand by farmers for technical assistance.

Plate 1.—A Water Supply for Pasture Irrigation and Stock Requirements.

Plate 2.—Part of the 503 Persons Who Attended a Departmental Beekeeping Field Day at Gatton College.

Plate 3.—Farmers Attending a Combined Soil Conservation, Farm Machinery and Pasture Management Field Day on the Darling Downs.

Plate 4.—Tipping Silage Into a Trench. Driving the loaded truck over the silage packs the silage and helps to control its temperature to the desirable range of 100-120 deg. F.

An important feature of the year was the setting up of a Dairy Pasture Advisory Committee, composed of representatives of the Division and of dairying industry organisations, which resulted in the formulation of a comprehensive programme of pasture investigations in dairying districts. A legume seed inoculum service to farmers was also commenced. In keeping with these types of activities, the importance of trace element deficiencies in soils was investigated and recommendations to overcome them were elaborated.

By 1948-49 the development of the regional experiment stations had reached the stage where not only were the major crops being investigated but the relationship of crops, pastures and animals was receiving attention. On the tobacco experiment stations the cultural, irrigation and nitrogen requirements of the crop were receiving attention. A large series of pasture improvement trials was commenced throughout the main dairying districts.

The soil conservation work reached such proportions that the Soil Conservation Service was embraced as a section of the Agriculture Branch.

The seed certification scheme was expanded during the year to include the first releases of certified seed of superior tomato varieties developed by the Horticulture Branch. The papaw improvement breeding programme had also reached almost the same stage. Certified seed of some eight maize hybrids, five varieties of grain sorghum, one of sweet sorghum, one of Sudan grass, and one of French beans was likewise available.

Three soil surveys were undertaken during the year and reconnaissance surveys were made for the Land Administration Board, thus showing an increasing dependence on the work of the soil technologist.

The flow of new insecticides, fungicides and weedicides placed increased responsibilities on the Science Branch, where the biological testing of a wide range of such materials had become an important feature.

During 1949-50 the effects of the previous programme of development of the Division became increasingly apparent. Interest in soil conservation measures increased to the extent that requests for assistance and advice covered almost a quarter of a million acres of land. Attendances at field demonstrations totalled an estimated 8,000 persons.

A dairy herd, a piggery and a poultry establishment were provided at the Kairi Regional Experiment Station, while an exploratory farm of 100 acres area was leased at Wrotham Park in the Gulf country to enable the possibilities of fodder production and the development of improved pastures for the far north to be investigated.

Following the development of superior varieties of tomatoes, particular attention was given at all three Horticulture Branch stations to investigations related to improving cultural and fertilizer practices for this crop. A highlight of other work of this Branch was proving the effectiveness of PCP as a weedicide for use in pineapple crops in Queensland. The programme of investigations related to this crop was intensified through the appointment of a Consultative Committee composed of industry and Departmental representatives.

One of the outstanding achievements of the year was the expanding success achieved by the Bureau of Sugar Experiment Stations, which was then attached to the Division of Plant Industry, through the use of benzene hexachloride in control of cane grubs and wireworms in sugar cane lands.

In general, the investigational programme of the Division had expanded to some 325 field experiments related to some 38 crops.

The seasonal conditions during the 1950-51 fiscal year provided favourable environments for testing the merits of a wide range of cultural and plant breeding programmes conducted on Departmental experiment stations and co-operators' farms. In the studies related to field crops, responses to soil moisture, to rainfall during the growth of the crops and to applications of nitrogen brought out clearly the value for both winter- and summer-growing crops of cultural methods which allow the fullest economical storage of subsoil moisture. In fact, the use of such practices appeared to eliminate the necessity for application of nitrogenous fertilizers on fertile soils to obtain good yields of either wheat or grain sorghum under a range of seasonal conditions.

The newly released Queensland-bred variety of wheat, Lawrence, showed outstanding resistance to rusts which had seriously attacked hitherto resistant standard varieties. A feature of the investigations dealing with grain sorghums was the outstanding results obtained in all sorghum growing districts with the first general release of the variety Alpha, which had been developed at the Biloela Regional Experiment Station. Plant breeders' successes were also obtained in strawberries, pineapples, citrus fruits and French beans.

The abnormally wet conditions experienced at several periods of the year provided excellent opportunities for testing the merits of various new hormones and other weedicides for weed control. Officers of the Horticulture Branch achieved much success in this direction.

By the 1951-52 year, soil conservation operations reached a stage of importance requiring legislation for the co-ordination of activities and responsibilities of the Departments and instrumentalities concerned with various phases of the work. A range of demonstration areas had by then been established on private farms in the districts exposed to greatest erosion hazards, and much investigational and extension work was carried out.

The provision of facilities for long-term investigational programmes was furthered by the acquisition of an area of some 1,920 acres of wallum country near Coolum. An agreement was also entered into between the Australian Meat Board, C.S.I.R.O. and the Queensland Government to investigate

improvement of the beef cattle industry in North Australia. Emerging from this was the purchase, by the Australian Meat Board, of "Brian Pastures," near Gayndah, for development into a research station of 5,300 acres conducted by this Department.

The dry weather prevailing through much of the year provided conditions favourable for demonstrating the drought resistance of buffel grass and the merits of cropping programmes that fully conserve rainfall.

The new hybrid wheat Spica was released for commercial planting and it is now pleasing to report that its popularity increased so rapidly that by the 1956 crop the acreage planted to it exceeded that under any other variety.

Two staff regional conferences were held—one at Brisbane for officers stationed south of Gympie and the other at Ayr. These provided a free interchange of information between district and administrative officers.

Through the Bureau of Investigation of Land and Water Resources and the University of Queensland, machinery was set up for the co-ordination of all soils work within the State, thereby avoiding overlapping of programmes and ensuring that the latest technical advances were available to all workers.

On July 1, 1951, the Bureau of Sugar Experiment Stations was transferred from the Division to control by a Board comprising the Minister and the Under Secretary of this Department and members representing cane growers and sugar manufacturers.

The outstanding feature of 1952-53 was the increase in public realisation of the value of grass as a crop and of the need for treating it as such. Departmental programmes in both the Agriculture Branch and the Regional Experiment Stations, from the inception of the Division, had consistently emphasised the importance of good pastures in the farm economy. It was therefore noteworthy that by 1952-53 there were 93 co-operating dairy farmers conducting some 110 pasture trials under Departmental supervision. Investigations on the Regional Experiment Stations had progressed to the stage where the generalisation could be made that under dry-farming conditions, improved pastures grown in rotations with crops could support approximately one dairy cow per acre.

The provision of facilities for investigational work was furthered during the year by the purchase of a farm in the Inglewood district for the development of a tobacco experiment station for South Queensland, and the acquisition of a large area at Parada in the Mareeba-Dimbulah Irrigation Project for the development of a tobacco experiment station for North Queensland. In addition to these tobacco stations, an area of some 900 acres was selected in the Millaroo section of the Burdekin River Irrigation Project for development into a Regional Experiment Station, with finance to be provided by the Burdekin River Authority.

Interest in soil conservation activities continued to expand and it was noted that farmers were realising that crop rotations and stubble-mulch farming played an important part in soil conservation practices.

An important feature of the year was the inauguration of additional extension activities financed through funds made available by the Commonwealth Government. The Division made available eight experienced officers to assist in the enlarged programme; these were replaced by temporary appointees employed under the Grant.

In addition to this increase in extension activities, the investigational programme of the Division, exclusive of the work on the Regional Experiment Stations, was expanded to embrace some 296 experiments dealing with some 43 different crop species.

The increasing interest in pastures during 1953-54 was indicated by the establishment of some 150 pasture trials in co-operation with stock-owners, while 125 dairy pasture trials financed in part by a grant from the Australian Dairy Produce Board were also conducted.

Interest in soil conservation continued to expand and was marked by the initiation of the State's first group conservation project—the Booie Road Project in the Kingaroy district.

Soil surveys in the Dalbeg section of the Burdekin River Project and in the Rocky Creek section of the Mareeba-Dimbulah Irrigation Project were made for the Irrigation and Water Supply Commission.

Interest in improved pastures continued to increase during 1954-55, as evidenced by the expansion in the number of entries for the pasture competition conducted by the Royal National Agricultural and Industrial Association of Queensland. Twenty-nine entries were received for the 1954-55 competition, which aroused such widespread interest that 85 entries were received for the 1955-56 competition. This competition was enlarged to include three classes—non-irrigated pastures in districts receiving a mean annual rainfall of less than 45 in.; non-irrigated pastures receiving a mean annual rainfall of over 45 in.; and irrigated pastures.

An outstanding feature with reference to pastures was the reported marked expansion in the spread of buffel grass in northern Western Australia, the Northern Territory and north-western Queensland.

Interest in irrigated pastures continued to expand, the biggest gain occurring in the Logan and Albert districts, where 400 acres of pasture were effectively established. An additional 25 bores were developed in the Nanango district with the help of the Irrigation and Water Supply Commission.

Important staff appointments of the year were a Senior Agronomist to specialise on tobacco research and an Agricultural Engineer to advise both farmers and departmental officers on farm machinery.

Plate 5.—Farmers Are Installing Equipment to Grade and Dust the Certified Seed They Produce Under Government Supervision.

Plate 6.—A New Method of Transporting Seed Cotton to the Ginneries in Bulk Rather Than in Wool Packs Promises to Improve Cleaning Operations.

Plate 7.—Unsprayed Brigalow Suckers Which Sprouted Following a Fire in February 1954. Photo taken May 1957.

Plate 8.—Brigalow Suckers Which Sprouted Following a Fire in February 1954 and Were Sprayed in April 1954 With Butyl Ester 2,4,5-T in Water. Photo taken May 1957.

The increased interest in both rain-grown and irrigated pastures occurring from 1950 onwards stressed the need for suitable legumes and methods of establishing them. This, in turn, necessitated a better understanding of the role played by legume nitrogen fixation. Arising out of the investigations related to this work it was found necessary to have a specialist officer employed whole-time in testing and developing supplies of suitable inoculums for the various legumes used in pasture and cropping programmes. Farmer appreciation for this service is evidenced by the increasing requests for inoculum, which by 1956-57 necessitated annual despatch of over 12,000 bottles.

During the first 12 months after the proclamation of the Fauna Conservation Act, important projects associated with fauna conservation were satisfactorily initiated. Similarly, laboratory assessment of wheat quality for adjudication for show competition purposes was done for the first time in Queensland and the district survey of wheat quality was continued.

A feature of the Horticulture Branch activities of the year was the detection of bunchy top in bananas in the Innisfail district and the initiation of an eradication campaign which achieved outstanding results. The commercial use of the hormone spray ANA, which regulates crop setting, enabled the canneries to handle satisfactorily a record pineapple crop.

Altogether, the widespread activities in which the Division by now was engaged were resulting in a substantial annual output of technical knowledge. This in turn focussed attention on the need for efficient methods of conveying such

information to primary producers. Accordingly, Division of Plant Industry officers attended a school of instruction in extension methods held during the year under the guidance of an officer who had studied modern extension practices in the United States of America.

Further provision of facilities for investigational work occurred during 1955-56. A very important feature was the reaching of an agreement whereby Federal and State Governments, tobacco manufacturers and growers combined to contribute finance and other resources in an effort to improve the tobacco industry. As a result, development of the Inglewood Tobacco Experiment Station was accelerated.

A new plant pathology field station was established at Kingaroy to serve the South Burnett district, emphasis being placed on peanut and cowpea diseases. A new entomological field station was opened at South Johnstone to serve coastal districts of North Queensland.

Development of facilities at "Brian Pastures" Pasture Research Station progressed sufficiently during the year to allow of its official opening.

Satisfactory progress was achieved in the development of facilities at the Millaroo Regional Experiment Station with the help of the Burdekin River Authority and the Irrigation and Water Supply Commission.

Further improvement in the overall pasture position occurred to such an extent that Agriculture Branch officers devoted more time to pastures than to any crop. Similarly, on regional experiment stations investigations related to pasture establishment and management, pasture-crop rotations, strain trials and seed production and harvesting had high priority in the annual programmes. An important phase of the work was the release from the Biloela Regional Experiment Station of sufficient seed of CPI 6934 Type D buffel grass, under the name of Biloela buffel, to enable five commercial seed producers to plant a total of 115 acres.

Demand for high quality seed of all crops coming within the seed Certification Scheme had reached such proportions that in each major certified seed producing area district officers devoted 30–60 per cent. of their time to operations related to the scheme. In grain sorghum alone, 12,403 bus. of seed were certified, in contrast to 5,000 bus. in 1953. It was estimated that approximately 95 per cent. of the 160,000 acres of commercial plantings of this crop in 1955-56 was sown to seed of not more than two multiplications from certified seed. It is satisfying that by this time Alpha, released from Biloela Regional Experiment Station in 1950-51, was the most extensively grown variety of grain sorghum in the State.

The heavy seasonal rainfall tested thoroughly the soil conservation measures that had been applied in previous years. It is pleasing to report that the results indicated their effectiveness.

These summaries of the main features of the activities of the Division during the first 11 years of its functioning, while necessarily brief, present the general pattern of its development.

Each year's results emphasised the progress achieved through developing experiment stations with facilities for conducting the investigations for which the stations had been planned. As the programmes expanded on the stations to embrace short-term and long-term investigations covering a wide range of subjects, the results obtained and the resultant impact on primary industries called for expansion of Divisional activities in many directions. Thus the plant breeders' releases of improved strains of various crops called for co-ordinated testing by experiment stations and farmer co-operators. Following the demonstration of the superiority of a strain over standard commercial varieties, the multiplication of stocks of pure seed necessitated, in turn, supervisory measures such as are provided under the Seed Certification Scheme.

In fact, each season witnessed an increasing demonstration of the interdependence not only of the several Branches of the Division, but also, in many directions, of all of the Divisions of the Department.

The operations of the Division during the 1956-57 season may therefore be described as covering a comprehensive programme of short-term and long-term investigations related in varying degree to most phases of primary production in this State. The reports of the Branches present in detail the more important findings of the season's programmes. Many of them are, of necessity, in the nature of progress reports, while others relate to the completion of investigations.

In view of the increasing volume of information becoming available from all Divisions, ways and means of evolving the most efficient and economical methods of supplying such information to the primary producers were examined during the year. The culmination of this examination was the holding of an Extension Symposium in Brisbane, which was attended by head administrative officers, the Directors and selected senior officers of all Divisions and selected senior field staff who had attended Extension Schools and had had considerable experience in organised extension activities. Arising out of the discussions during the four-day programme of the Symposium, plans were developed for future extension activities of the Division as part of an overall scheme for the Department which is now under examination.

A survey of the Division's activities such as this would not be complete without some reference to staff activities. Starting the development of the Division so soon after cessation of World War II posed many problems. The demand for technically trained men which developed in most secondary industries related to primary industries was so acute at first that required recruitment of staff to the Division was only possible to even a slight extent in the more junior grades. Such gains were offset by loss of experienced staff through retirement, death and resignation to enter more remunerative fields of employment. In more recent years the position has improved, but important vacancies in staffing requirements still exist.

The Divisional staff position for the period 1945-1957 inclusive is summarised in the following table. Staff totals of technical grades, including cadets and scholarship holders attending the University, have increased from 129 to 288. Unfortunately, this expansion does not represent a gain in experienced workers, for, during the same period, there was a loss of 95 members of the technical staff through death, retirement, transfer and resignation, the resignations totalling 58.

Staff Groupings.	1–7–45.	30–6–57.
Administrative and executive research officers	14	29
Other research grades	39	75
Advisory and experimental staff	44	70
Assistant advisers and assistant experimentalists	..	15
Other technical grades	16	40
Trainees	16	59
	129*	288

*Of this staff, 33 were absent or war service.

The progress that has been achieved within the Division in the face of such staff losses reflects great credit on all concerned. It has only been achieved by the outstanding enthusiasm and zeal of both senior and junior officers—many of the latter undertaking responsibilities in excess of their classification, thus increasing the load of supervisory duties assumed by the more senior men.

It will be seen that 51·5 per cent. of the total staff increase over the 12 years is in the final three groupings, i.e. the relatively junior grades and the trainees.

In an endeavour to allow specialist officers to keep fully abreast of developments in their particular fields, the administration has arranged during this decade for many officers to attend appropriate conferences within Australia and overseas.

During 1956-57, two officers visited New Zealand for the Seventh International Grasslands Congress, one officer was sent to the U.S.A. to study biological control of Noogoora burr, two officers were granted leave to go overseas on scholarships, and one was given leave to attend Adelaide University on a scholarship for special post-graduate study in genetics. Additionally, nine officers attended special conferences in other States and opportunity was afforded several officers to attend the Second Biennial Conference of Commonwealth and State Entomologists held in Brisbane and to participate in the associated entomological field trips.

DIVISION OF ANIMAL INDUSTRY.

Director: Mr. W. Webster.

Service to the animal industry by the individual effort, as well as by co-operation and co-ordination, has been continued and further developed during the 12 months under review.

With the quick expansion of the Department during recent years, the increasing number of staff and the formation of new Branches, constant care has been necessary to keep services co-ordinated.

The acceptance by the States and the Commonwealth of the need for continuing examination and review of research and investigational problems to prevent overlapping and repetitive work is encouraging.

The Commonwealth Extension Services and Dairy Industry Extension Grants have been of great assistance to the States not only in developing important aspects of extension through demonstration but in bringing the Commonwealth and various State staffs together.

The provision of funds by the Commonwealth to expand extension work has not only achieved this objective, but has led to the development of work on the broad problems of the industries. It seems that to get full benefit from this present trend, the provision of funds for research by the States into the important problems of the farming and pastoral industries should follow.

There is now developing a general pattern of co-ordinated attack on the problems common to the animal and agricultural industries of the Commonwealth by a wide range of technical forces.

This type of approach is also emerging as a result of the work of the several technical sub-committees of Commonwealth and State animal industry officers. The Animal Production Committee is at present developing a survey of the problems of the animal industries and listing the work being undertaken by each organisation concerned. When this is completed, a plan will be laid down in which repetitive work will be avoided and special investigations directed to the organisation best fitted to undertake particular work. The Biennial Conference of Chief Veterinary Officers of the States and Commonwealth is also working on similar lines.

The interest now shown by the States in the advantages of artificial insemination has led to the acceptance by all of the broad principles to be included in draft legislation for the control of the practice. This will deal with the training and licensing of inseminators, collection and distribution centres and the control of disease in bulls used for collection. Details of draft legislation are now being considered in this and other States.

Widespread outbreaks of foot and mouth disease of cattle and other cloven-footed animals throughout the world have brought this disease into prominence in recent years. An outbreak in Canada said to have been transmitted on the clothes of a migrant drew attention to the danger of infection being introduced into Australia by similar means.

The Canadian outbreak was successfully dealt with by quarantine and slaughter-out of all infective and in-contact stock. Swine fever and foot and mouth disease have been similarly dealt with in Australia in the past. Following the Canadian outbreak, it was evident that administrators and the industry were in favour of dealing with a possible future Australian outbreak of foot and mouth disease in this way. Representatives of the States and the Commonwealth have now agreed on the principles of compensation and the proportions of contribution should an outbreak occur in any part of Australia. Veterinary administrators have also agreed on the methods of diagnosis and eradication and the assistance that will be made available by each organisation.

The principles involved in necessary additional legislation dealing with control and eradication and the payment of compensation have been agreed to and preparation of such legislation is now under consideration by each State and the Commonwealth.

It has long been realised that infertility and abortion are the cause of great loss of production in the dairy industry. It is believed that no one single factor is responsible for the condition and a number of diseases and deficiencies are known or suspected to play a part.

Realising this, it was decided by a special committee representing the States and the Commonwealth to carry out surveys to clarify the position. As a result of this joint work, it is now clear that there are a number of diseases and a nutritional factor that need further investigation. This work has been split up between the various organisations concerned and it is expected that a concerted drive will produce valuable results.

Cattle tick and tick fever cause considerable loss of production in the cattle industries of northern Australia. Commonwealth, State, university and chemical industry investigators are working on the various aspects of this problem. During the year a special committee on which are Commonwealth and State representatives was set up by C.S.I.R.O. to examine the problems that require attention and suggest how and by whom they should be attacked. The Queensland workers have now adopted the recommendations of this committee, and work with cattle tick, tick fever and the chemicals used for treatment is being expanded.

Within the State, attention has been given to encouraging the various workers in the field of animal husbandry and disease control to work

as a team and not as individuals whose work might otherwise overlap or repeat that of others.

The testing of cattle for tuberculosis by veterinary practitioners on behalf of the Department is well known and does not need recounting here. It might be recorded, however, that approximately 800,000 dairy cattle are included in the scheme, which involves the greater part of the dairying districts of Queensland.

The expanding export trade of cattle on the hoof to the Philippines, New Guinea and other Pacific countries is under the control of the Department, but where possible, the routine testing and collection of specimens for testing is carried out by private veterinary practitioners.

The inoculation of calves with Strain 19 vaccine against brucellosis was stepped up by 50 per cent. in the past year. Most has been done by private practitioners, who will henceforward be able to extend this work to adult animals in special cases.

The immunisation against tick fever of stud cattle introduced from clean areas has been largely undertaken at the Animal Research Institute, Yeerongpilly, and the Animal Health Station, Oonoonba. This involves the housing and feeding of the cattle at these centres during the period of immunisation and adds to the cost. Since veterinary practitioners have become established in country districts in Queensland, there has been some evidence of their interest in this work. It is believed that this is now increasing because of the realisation by the stock-owner that the cost would be much less if the bull were immunised on the owner's property.

The co-operation between Divisions within the Department, reported more fully in previous reports, is continuing and expanding. This has been shown very clearly in the work associated with the Commonwealth grants and particularly in the dairy industry. There is also very real co-operative work continuing and expanding with the Division of Plant Industry in the beef industry.

As previously mentioned, the trend towards the production of lighter weight carcases from younger animals is only possible if a steady supply of nutritious fodder is available. If such production is to succeed it is obvious that something additional to native pastures is needed during the dry winter months of the year. Grazing crops, special winter-growing pastures or conserved fodder seem to be the answer to this need.

Current research work by the two Divisions at "Brian Pastures" (Gayndah), the Bureau of Tropical Agriculture (South Johnstone), Ayr and Millaroo Regional Experiment Stations (Burdekin irrigation area), and a number of other Departmental experiment stations is a clear indication that the staffs of the two Divisions are working together on the problem of providing a high plane of nutrition throughout the year. Joint operations are already taking this work into the field, and the appointment of staff from the two Divisions to districts where further work is planned to be undertaken will assist in strengthening the trend referred to above.

The Extension Methods training section of the Department, through in-service training schools during the last four years, has broadened the approach of extension staffs. This broadening has, above all else, made extension officers aware of the need for co-operative work. Already there is abundant evidence in some districts of close consultation between staff of the various Branches and Divisions. This has been accelerated where leaders have appeared and it is apparent that their appearance has been a result of the extension training schools.

It is now clear that extension mass media and methods specialists are required in all Branches and Divisions and provision for this is being arranged.

TECHNICAL ADVISORY COMMITTEES.

Co-operative work between Branches within the Division, referred to in previous reports, continues to grow. This has been accelerated by the formation of technical advisory committees.

These committees have been formed with a basic personnel of four members—one from the extension field, one from the research field, one from biometrics and one from the Divisional administration. To them can be co-opted, as and when required, specialists in any particular aspect of the work. Those already formed are the poultry husbandry, pig husbandry, cattle husbandry and diseases of animals committees. The work of the last-mentioned committee will be much more complicated than that of the others, inasmuch as it deals with all animal diseases, and the committee will need assistance from time to time of personnel from the various husbandry Branches.

The objects of these committees are to plan research programmes and evaluate the results of research. It is felt that this is a realistic approach. There will be scope for and encouragement of co-operative work between field and laboratory staffs: the field officer who is constantly coming in contact with the problems of the animal industries can advise on their relative importance, the research representative on the methods and practicability of the research required, the biometrician on the requirements to achieve statistical significance, and the Divisional administrator on general technical aspects, not to mention finance and personnel. Priorities can then be worked out by the committee as a whole.

Technical Advisory Committee on Animal Diseases.

The functions of this committee at this stage may be stated as follows:

(1) To review results of disease research at the Animal Research Institute, Yeerongpilly, and Animal Health Station, Oonoonba, and arrange for application of same in the field where appropriate.

(2) To make suggestions for research work which would be related to disease problems met with in the field.

Construction of a Pig Testing Station on the Rocklea Animal Husbandry Research Farm.

(3) To act as a liaison body between field veterinary services and the research side of the Division.

(4) To give consideration to what Branches should be concerned with individual disease control measures.

Research staff is often too isolated from field staff and this militates against full co-ordination of effort between the two arms of the Division. This committee should ensure that the research side of the Division is kept well informed as to disease problems met with in the field. At the same time, it should assist greatly in speeding up the transmission of results of research on such problems to the field staff.

Pig Technical Advisory Committee.

This committee met on three occasions. It has taken stock of the facilities available for investigational work on Regional Experiment Stations and reviewed what has been done by the Pig Section thereon in recent years.

At Kairi, several experiments on the feeding of molasses have been carried out. These experiments have shown that molasses can be successfully fed to pigs in amounts up to one-third of the ration—at least at certain stages of growth. Carcase quality is not affected and the efficiency of food conversion is satisfactory in comparison with results obtained on an all-meal ration. Some trouble with scouring may be encountered, but this, it seems, can be overcome by increasing the amount of fibre in the ration. Further work in this connection is proposed because of the importance of molasses feeding in the region.

Under Queensland conditions grazing could play a major role in pig keeping, but more factual information is necessary. This is so especially in relation to the extra time, if any, needed to get grazing pigs to market, the saving, if any, on food costs, and the effect, if any, on carcase quality. The Pig Committee is mindful of this need and is actively working to provide the required information. The Regional Experiment Station at Biloela is the main centre of operations for this work.

Early weaning of pigs has also been given a good deal of attention by this committee. The investigational work involved has been centred on the Regional Experiment Station at Hermitage, but some work has been done on private properties. Opinion is hardening in favour of weaning at 4 weeks rather than the 10–12 days ordinarily in mind when early weaning is under discussion.

Late in the year, the Pig Committee commenced giving consideration to rules and procedure for pig testing at the Pig Testing Station now under construction at Rocklea. Good progress was made with this important task and it is anticipated that a well-prepared detailed operational plan will be available in good time.

Cattle Technical Advisory Committee.

The Cattle Technical Advisory Committee met on four occasions. The Committee's main concern to date has been to obtain a true picture of the basic problems of the beef cattle industry. To that end, much preliminary thought and work have gone into preparations for a State-wide survey designed to supply the answers to a number of questions relating to the welfare of the industry. It is anticipated that this survey will enter the action phase early in the new financial year. From the survey, it is hoped, will come information that will enable long-term research programmes to be laid down.

It is often accepted that subdivision coupled with rotational grazing will give substantially better results than set stocking on a comparable undivided area, all other things being equal. The Cattle Committee felt that this needs careful checking, using both native and improved pastures. The Committee felt also that in any comparison between improved and native pastures it was essential that rotational grazing be provided for, on the native pastures as well as on the improved pastures.

Given the necessary facilities, a trial designed to yield information on the winter and spring-time liveweight losses of beef cattle running concurrently on improved and native pastures under rotational and set stocking schedules should prove of fundamental importance. This would be especially so if pasture sampling and analysis and feed intake determinations at appropriate intervals were an integral part of the trial.

It may be noted here that work at the "Brian Pastures" Research Station is expected to assist greatly in settling such issues. It is pleasing here to be able to record that a very satisfactory liaison exists between the Cattle Technical Advisory Committee and the Committee which acts in an advisory capacity to "Brian Pastures."

Poultry Technical Advisory Committee.

The Poultry Research Advisory Committee, as is its normal custom, reviewed research work carried out at Yeerongpilly and Rocklea during the previous 12 months and gave consideration to a programme for the next 12 months. Details of the former will be found in the report of the Senior Poultry Husbandry Officer. It is sufficient to say here that the Committee was called upon to review a long list of projects relating to the feeding, breeding and management of poultry.

It is the Committee's hope that in the coming year it will be possible for a considerable expansion of activities on the breeding side of poultry husbandry to be effected. Permanent facilities are now available for random sample testing in conjunction with a poultry improvement plan and big developments are expected. At the same time, it is planned to maintain an energetic programme of experimental work in the field of nutrition. Further investigations are also in mind in connection with husbandry practices such as artificial lighting and debeaking.

Sheep Technical Advisory Committee.

A sheep technical advisory committee is the latest to be constituted and will be functioning actively during 1957-58.

RESEARCH WORK.

There appears to be a great deal of misconception concerning research in the agricultural industries. Many people seem to be of the opinion that research is not one of the functions of a State Department of Agriculture. The reason for this may be that the work of these Departments covers a very wide field of effort and the large amount of extension, diagnostic and service work done is apt to obscure the fact that research work is also carried out. Certainly this is the case in Queensland, yet research work both in the laboratory and in the field is going on continuously.

It is agreed that diagnostic work associated with the thousands of specimens received from the field does take up a good deal of the time of the staff of the research stations, but it is from this type of work—assisted and guided, of course, by a large and active field staff—that they discover the real problems of the livestock industries.

The list of achievements of the research staff of the Division of Animal Industry during recent years is one of which to be proud. It includes much original work. A few features might be mentioned here.

The system of immunisation of cattle against tick fever which makes it possible to introduce stud animals from tick-free to tick-infested areas has been responsible for continuing introductions of beef bulls from the leading studs in other States. Modifications of the original immunisation procedure over the years have resulted in the development of a highly effective method. Research in this field is continuing in several directions. It has been recently shown that animals can be successfully immunised against *Babesia argentina* with infected blood stored under deep freeze for six weeks. New drugs to control tick fever are tested as they become available, and the duration of immunity and of infectivity of ticks is being studied in relation to the more effective methods of tick control now available.

Spraying with organic phosphorus compounds has indicated that two treatments at very short intervals may kill ticks of all ages. This, if confirmed in the field, would simplify treatment of stock moving from infested to "clean" country and eliminate costly hold-ups.

Investigations concerning changes in the physical characteristics of a DDT formulation in cattle dips have commenced. These investigations, which are of great practical importance, will include tests of biological efficiency.

One of the most notable achievements of State researchers in connection with bacterial diseases was the discovery of a new species of *Brucella* as the cause of the infertility problem in rams commonly referred to as epididymitis Laboratory workers at Yeerongpilly have also shown that *Leptospira pomona* is a potent cause of abortion and still-births in pigs; this infection is now believed to be of far greater importance than swine brucellosis in this State. The same organism was also proved to be responsible for a highly fatal disease of calves manifested by fever and red urine (haemoglobinuria). The cause of this disease had baffled investigators throughout Australia for many years.

Toxic plants kill large numbers of cattle, sheep and horses each year and valuable contributions to our knowledge of plant poisoning have been made by Departmental research staff, especially over the past decade. Georgina River disease, for example, though confined to the Georgina River basin in north-western Queensland, may cause very heavy losses (up to 1,000 head of cattle have died on one property in one year), and considerable areas in this region are not fully utilized because of the risk of

losses. A team of workers, including botanists and research veterinarians, has now proved that Georgina gidyea (*Acacia georgina*) is the cause of this trouble.

The importance of stock horses to the grazing industries is clearly recognised and horse diseases have received considerable attention in north and western Queensland. The causes of the important diseases are now clear. Birdsville disease results from the ingestion of *Indigofera enneaphylla; Gomphrena celosioides* produces "coastal staggers"; and a species of *Crotalaria* causes a wasting disease accompanied by ulceration of the oesophagus and stomach. More recently, the so-called "change hoof" disease has been found to be due to selenium taken up by certain plants.

The causative agents of no less than 20 important diseases of livestock have been determined by the research staff of the Animal Industry Division in the past decade, and additions have been made to existing knowledge of many others. Few of the long-standing problems remain, but new diseases continue to attain importance. An active and adequately equipped research staff is accordingly most necessary to cope with these and to keep abreast of technical advances in other fields.

In spite of the importance of disease, drought still remains the major cause of economic loss in our grazing industries. Although much has been done throughout Australia on drought feeding of sheep, until recent years no concerted attack has been made on this aspect in relation to cattle. Our initial research in drought feeding of cattle has aimed at evaluating fodders that can be conserved on grazing properties. Results of experiments have shown that some of our native pasture hays are readily eaten and will allow cattle, confined in yards, to survive for five to six months with little weight loss. Information on the value of supplementation of this type of roughage with grain and protein-rich concentrates is being accumulated. Research is continuing in this field with both native pasture hays and sorghum silage.

The results of these experiments have yet to be applied in the field but the basic information now available is clearly of great value and will stimulate further work.

Along the eastern coast of Queensland there is much fertile land, but there are also large areas of poor land carrying a stunted type of vegetation. These areas are obviously deficient in minerals. Phosphate deficiency is important in stock, but this does not seem to be the whole story. Work by soil scientists and others is in progress in Queensland but is not yet completed. Cattle in these deficient areas develop a craving for the deficient minerals and will also eat plants that normally are not attractive to them. Poisoning from some of these plants is not uncommon, and in recent years staff from the Research Branch have demonstrated this experimentally.

Stock in these areas not uncommonly chew bones and even dried-out carcases. During the past year, staff of the Veterinary Services Branch have suspected that some of the deaths are due to a bacterial poison and the research staff has demonstrated that the toxin of a bacterium called *Clostridium botulinus* is sometimes recoverable from affected animals. This toxin is very potent and is retained in the bones and dried tissues of animals that have died from the disease. Animals that chew these bones or tissues will also die from the same toxin. Thus, botulism can now be included in the complex that is loosely called "coast disease."

Long-range trials to overcome phosphate deficiency by treatment of drinking water, top-dressing of pastures and the feeding through licks of phosphate-rich substance are in progress. These trials are operating in inland areas as well as on the coast.

Investigations concerning copper deficiency in sheep and cattle are also taking place in different parts of the State. Results are variable and no conclusions can so far be drawn.

An exceptionally interesting experiment concerning vitamin A deficiency in poultry was completed during the year. It would appear that when vitamin A deficiency is shown by clinical symptoms the egg production rate has already decreased very considerably and hatchability of the eggs declined to zero. Analysis of the liver will demonstrate this deficiency at a much earlier stage. It has also been shown that there is a quick return to full production and normal hatchability when a vitamin A supplement is added to the ration.

At the Toorak Field Station, research continues into the problem of low lambing percentages in the tropical environment. The use of thyroid preparations, as suggested by results obtained in the more favourable New Zealand environment in increasing wool growth and improving ram fertility, did not yield favourable results in the Toorak environment. Further work was also undertaken to examine the effect of brucellosis on ram fertility.

One of the more important projects of the Sheep and Wool Branch has been aimed at improving the cut per head of Queensland sheep through the use by Queensland stud masters of the fleece measurement facilities in its Wool Biology Laboratory. This work is promising but slow and will have to be kept going for some time before the continued small gains become obvious to all. Work of this type is also going on at Toorak Field Station as a research project tied in with the overriding research into reproduction.

PRODUCTION.

The rainfall pattern for the State was unusual. The spring was very dry and there was no useful rain until December, when good falls were registered. Except in a few districts, the season then remained dry from January to the end of June. This means that there were two long dry periods—one in the spring and the other during the autumn and early winter. Following on a long series of wet years, the lack of rain in the spring did not have a serious effect. The dryness of the late summer, autumn and early winter months, however, had a serious effect on crop and pasture production and on the animal industries dependent thereon.

The dairy industry was short of good pasture in the late spring and early summer, but was not seriously affected until the autumn. The lack of nutritious pastures was accentuated by the more or less complete absence of fodder crops, particularly during the winter months. Hand feeding was practised where conserved fodder was available, but the long series of good seasons has not encouraged dairy farmers to lay down any great amounts of ensilage or hay. Dairy production at the end of June was at a very low level and a dry spring may well be disastrous.

Soil moisture from the previous good years and rain in early summer provided sufficient grass to maintain beef production until the end of April. There was a loss of body weight in cattle for the remaining two months of the year, and if rain does not fall in the early spring there could be heavy losses. The gradual increase of cattle numbers during recent years will accentuate the seriousness of the position, and should the normal monsoonal rains be late or fail next summer, the cattle losses could be disastrous.

During recent years there has been increasing interest by buyers in younger, light-weight cattle. This has been particularly evident during the last two years with buyers from New South Wales, but has not become more general. Many of these cattle have been produced in southern Queensland and topped-up on crop. The good pastures in recent years of heavy rainfall have made it possible in some districts to market young cattle fed only on these native pastures.

It will be enlightening to watch the effect of drier seasons on this trade. It seems that the economics of limited supplementary feeding will have to be examined if a steady supply of young beef is to be produced for the local market and for export. It seems likely that 1957-58 and 1958-59 will be important years in the future development of this trade.

It is hoped that the lack of conserved fodder during what may be dry seasons in the next year or so will stimulate a greater interest in the production of hay and ensilage by dairy farmers and graziers.

Whilst palatable pit ensilage is probably the best of these fodders, the successful feeding trials with bush hay referred to in another part of this report indicate the value of this lower quality fodder under some conditions.

If the production of young beef for the local and overseas markets is to be maintained, a steady supply of good quality fodder must be available during all seasons of the year. Similarly, if winter milk production is to be maintained, good quality fodder must be available during the winter months.

Smaller harvests of both wheat and grain sorghum have affected production in the pig and poultry industries. In the pig industry, this led to slightly reduced production which with increased demand created less incentive to produce a higher quality carcase. Although it is generally accepted by the industry that grading of pigmeats is worth while, there has been no general request for its implementation on a fixed routine basis. In the poultry industry, higher feed costs have reduced the margin of profit on eggs, but, of course, the low export price has been the main factor involved.

It cannot be said that seasonal conditions have yet had any serious effect on the wool industry. There is at present adequate dry pasture in most of the sheep country with the possible exception of some southern areas, although winter rain has given some relief there. With sheep numbers so high, it will need good spring rain to make the position safe, and if dry weather continues serious losses could result.

It must not be forgotten, however, that continued wet seasons have built up the parasitic worm population; growth rate of sheep and wool production have been affected as a result. Dry seasons will affect the nutrition of sheep but will also bring about a reduction in the level and spread of worm infestation with resultant indirect advantage.

Similarly, during recent wet seasons there has been what appears to be a gradual spread of cattle tick infestation into areas normally considered clean. Whether these new infestations really represent introductions from infested country, or simply previously existing very light infestations that have become more apparent due to continued wet and humid weather, is not known for certain. There have been similar occurrences in the past following a series of wet seasons, and with the onset of dry seasons the infestations seemed to disappear.

Good seasons with an increased stock turn-off create heavy movement of meat-producing stock. Under these conditions, there is usually greater spread of contagious and infectious diseases as well as an increase of external and internal parasites. Pleuropneumonia of cattle, for example, is usually more troublesome in good seasons and the spread of this disease to "free" areas is more common.

The Director of Sheep Husbandry has drawn attention in his report to the heavy cost of treatment of internal parasites of sheep. A somewhat similar story could be told concerning the cost of treatment of cattle tick and tick fever, which is so much greater in wet seasons.

Whilst it is not suggested that dry seasons are preferable, it is pointed out that one of fair length could check the spread and substantially reduce the present heavy incidence of external and internal parasites, with advantage to the grazing industries.

STAFF.

The details of staff changes appear in the reports of the various Branches.

Mention must be made in my report of the serious losses sustained by the retirement and resignation of senior staff members who were key men in the development of services to the animal industries.

The loss of Dr. J. Legg from the position of Director of Research was normal and expected, as he had reached the retiring age. His valuable contributions to the control of disease in the stock industries, particularly his work associated with the control and prevention of tick fever in cattle, will long be remembered. His thorough knowledge of work in other countries

gleaned from his extensive study of current veterinary literature will be greatly missed by the staff at the Animal Research Institute, Yeerongpilly.

Mr. A. K. Sutherland, throughout the years of his employment at Yeerongpilly, was a driving force in the development of much of the valuable work done at the Institute in both the health and husbandry fields. Following his return from overseas in 1947, his encouragement to staff at all levels and his personal capacity for work of a high order set an example to the staff of the Institute and was responsible for a fine team spirit. As he had been trained in both the health and the husbandry fields, his resignation some 18 months ago was a severe loss.

Dr. G. R. Moule is well known to all associated with the animal industries in Queensland as a man of ability and great capacity for work. The development of the Sheep and Wool Branch from virtual obscurity to a well-trained team of research and extension workers is well known to the wool growers of Queensland and the scientific workers of Australia. His resignation also was a severe loss to the Department and to the industry. It occurred at a time when his well-planned attack on the problems of the sheep industry of Queensland was succeeding.

Both these men who ranked so high in their own field have been attracted away from the Department by the much greater financial rewards offering in private enterprise. Unfortunately, though, it is very doubtful whether the results they can be expected to obtain in their new fields of endeavour will be as valuable to the stock industries as the achievements they would undoubtedly have made as Departmental officers.

DIVISION OF DAIRYING.

Director: Mr. E. B. Rice.

Unfavourable seasonal conditions and a recession in the prices received for exportable surpluses of butter and cheese on the United Kingdom market caused a serious setback to the dairying industry during the year under review.

The year opened well due to the good general rains in May and June, 1956, but in the first five months below-average rains were responsible for production failing to show the normal rise in the spring. Useful rains fell in December and were followed up in January and February, but the remaining months were abnormally dry in all parts of the State except North Queensland. These conditions resulted in a marked fall in milk yields in the autumn and early winter months. At the close of the year drought conditions prevailed in the major dairying districts. Some useful rains late in June gave partial relief, but further good falls will be needed early in the 1957-58 season to stimulate the growth of pastures and fodder crops and replenish surface water supplies.

There were wide fluctuations in the prices received for Queensland butter and cheese on the United Kingdom market, the extremes being 248s. and 319s. stg. per cwt. for butter and 175s. and 292s. per cwt. for cheese. Towards the end of the year the situation became brighter and butter prices appeared to have become more stable at about 320s. sterling per cwt.

The Commonwealth Government's guaranteed price scheme for butter and cheese consumed within Australia plus exports amounting to 20 per cent. thereof, which was provided for under the Dairy Industry Act of 1952, terminated on June 30, 1957.

Legislation has been introduced in the Federal Parliament to implement a new stabilisation scheme for a period of five years from July 1, 1957. The conditions of this scheme vary in only minor respects from those of the previous plan. The total amount of subsidy for the first year will remain at £13,500,000, as in 1956-57. This subsidy, which is passed on to farmers through factories, will represent at least 6d. per lb. commercial butter, or about 15 per cent. of the farmers' actual pay cheque. By agreement with the State Governments the Commonwealth Government will continue to determine the ex-factory prices for butter and cheese consumed in Australia. New features in the renewed scheme provide that funds may be used by the industry for research and sales promotion purposes approved by the Minister for Primary Industry, and that the amount of subsidy in each year will be a fixed sum which will be determined by the Commonwealth Government before the commencement of the year.

During the period July to mid-November the writer was overseas in order to attend the International Dairy Congress in Italy and to visit leading overseas dairying countries. This visit enabled contact to be made with many of the world's foremost dairying authorities at the Congress and in their own countries and to observe and discuss important trends and developments in the dairy practices of other countries. A report on these observations was prepared and circulated. Several addresses on various phases of overseas dairying industries have been delivered to industry organisations and action is in train for the introduction of practices considered deserving of application with or without modification under Queensland conditions.

The most conspicuous features in overseas dairying countries were centralisation of factories, diversity of products, increasing mechanisation towards the ultimate objective of automation or semi-automation in factories, in-place cleaning, improved packaging, sales promotion schemes, improved pasteurisation or other heat-treatment techniques, schemes for improving the compositional quality of milk, bulk tanker pick-up of farm milk supplies, artificial insemination, herd recording, and the eradication of diseases of dairy cattle.

THE BUTTER INDUSTRY.

The adverse seasonal conditions are reflected in the decline of 7,100 tons of butter produced during the year compared with the preceding year. The respective productions for the two years were 41,089 tons and 48,189 tons.

Less frequent deliveries of cream to butter factories, a lengthy hot summer, depleted water supplies at dairy premises towards the end of the year, and dry pastures over a prolonged period all played their part in detrimentally affecting the quality of cream received at factories and, in turn, the quality of butter. The gradings by the Commonwealth and State grading staffs of butter examined by them, which represented 74 per cent. of the total output, were: 34·27 per cent. choice grade, 54·45 per cent. first grade, and 11·28 per cent. second and pastry grades.

Even allowing for the difficulties encountered during the year, the results, as well as those of recent years, are most discouraging and indicate that generally there is an apathy in the industry towards a positive approach to butter quality improvement. All efforts by the Department, which have been very considerable in recent years, will fail to achieve the desired end unless and until the industry itself becomes imbued with a determination to face up to the problem. It is not denied that there are real

difficulties confronting the Queensland dairying industry. However, these cannot, and should not, be taken as an excuse for low quality, but they should be accepted as a challenge. If resolutely tackled, there is no doubt that an appreciable improvement is possible.

My observations overseas were that the wide range of flavour variation in Queensland butter is a serious initial marketing disadvantage in competing against the uniformly good flavoured butter of other countries on the British market. On the other hand, the body and texture of Queensland butter are not surpassed. As butter flavour is primarily dependent on the quality of the cream from which it is manufactured, it is clear that the crux of the Queensland butter quality problem is the failure of a high proportion of farmers to supply to the factories cream of the necessary quality standard.

There has been an appreciable capital expenditure in recent years on factory equipment to permit more intensive processing of cream with a view to improving butter quality. Unfortunately, factories which have installed this equipment have often tended to relax cream grading standards in the hope that intensive factory treatment will enable a greater volume of "border line" cream to be mixed with choice quality cream to produce a bare choice grade butter. These efforts have failed in their objective, which will only be attainable if there is an overall improvement in cream quality.

Concern is being felt in some overseas countries about extraneous matter in dairy products. Tests have been regularly performed in the laboratories during the year for the guidance of factories and field staff in reducing this type of contamination. The Queensland Butter Marketing Board has co-operated by purchasing special equipment for investigations at a factory. Several modifications of the equipment were necessary to develop a practical method of cream filtration during factory processing. There still remains, however, the necessity for farmers to take appropriate action to keep down dust and similar contamination during the production and storage of cream on farms.

Due to the restrictions on the importation of suitable timbers for the construction of butter churns, and the fungal decay which occurs with indigenous timbers, work has been proceeding for some years on the fungicidal treatment of Queensland timbers which might prove satisfactory for replacing imported timbers. However, success has not been attained.

The concern of factory managements about the life of wooden churns and the expense involved in their periodic replacement has led to attention being turned to the alternative of metal churns. In the past these have not been of large enough size for some factories and the control of the temperature of the cream during churning has been difficult under the warm climatic conditions of this State. An insulated metal churn installed during the year at the Kingston factory is giving satisfaction, and several other factories are contemplating the substitution of metal churns for wooden churns which require replacement.

The new factory of the Queensland Butter Marketing Board, which is probably unequalled by any other butter patting and packing plant in Australia or overseas, completed its first year's operations. The Board has actively interested itself in the development of the Asian market for butter, butter concentrate, butter oil and ghee, and its initiative in exploring the possibilities in these countries is to be commended.

THE CHEESE INDUSTRY.

The relative returns to suppliers of cheese factories have been somewhat better than those of suppliers to butter factories during the year, and as a consequence some cheese factories obtained additional suppliers. Despite the protracted dry seasonal conditions, cheese production for the year was well maintained. Production was 7,137 tons, compared with 7,580 tons in 1955-56.

There was a pleasing improvement in cheese quality, due chiefly to the manufacture of cheese of somewhat lower moisture content and the payment of premiums for high quality milk by some factories which utilize their milk intake partly for the liquid milk trade and partly for cheese manufacture. The grading results for the past three years are set out in Table 1.

TABLE 1.
CHEESE GRADES.

Quality.	1954–55.	1955–56.	1956–57.
	Per cent.	Per cent.	Per cent.
Choice and First ..	84·28	81·04	86·54
Second	14·00	15·79	11·85
Third	1·72	3·17	1·61

Approval was given for the Caboolture Co-operative Dairy Association to manufacture cheese at its Woodford branch factory and the necessary equipment is now being installed; manufacture should commence in the spring of 1957. The Warwick factory, which commenced to manufacture Edam cheese during the year, has found that there is a consumer acceptance of this variety. It should appeal for such purposes as the sandwich trade because of its smooth texture and good slicing characteristics. The first cheese crate assembling and nailing machine in Queensland was installed at the Toowoomba factory.

Waxing of cheese continues to increase. In view of the higher prices received for waxed cheese on the British market and its improved appearance, the aim should be to wax all cheese exported. Waxing also reduces weight losses and prevents the development of unsightly mould growth on the surface of the cheese.

At the request of the cheese industry, regulations were inserted in the Dairy Produce Acts towards the end of the year prescribing that milk supplies to cheese factories shall be graded by the methylene blue test and at least 2d. per lb. butterfat more paid for first grade than for second grade milk. The regulations relating to semi-mellow and mature cheese were amended to provide for distinctive coloured wax coverings

Plate 1.—Interior of the Butter Marketing Board's Premises at Hamilton, Brisbane.

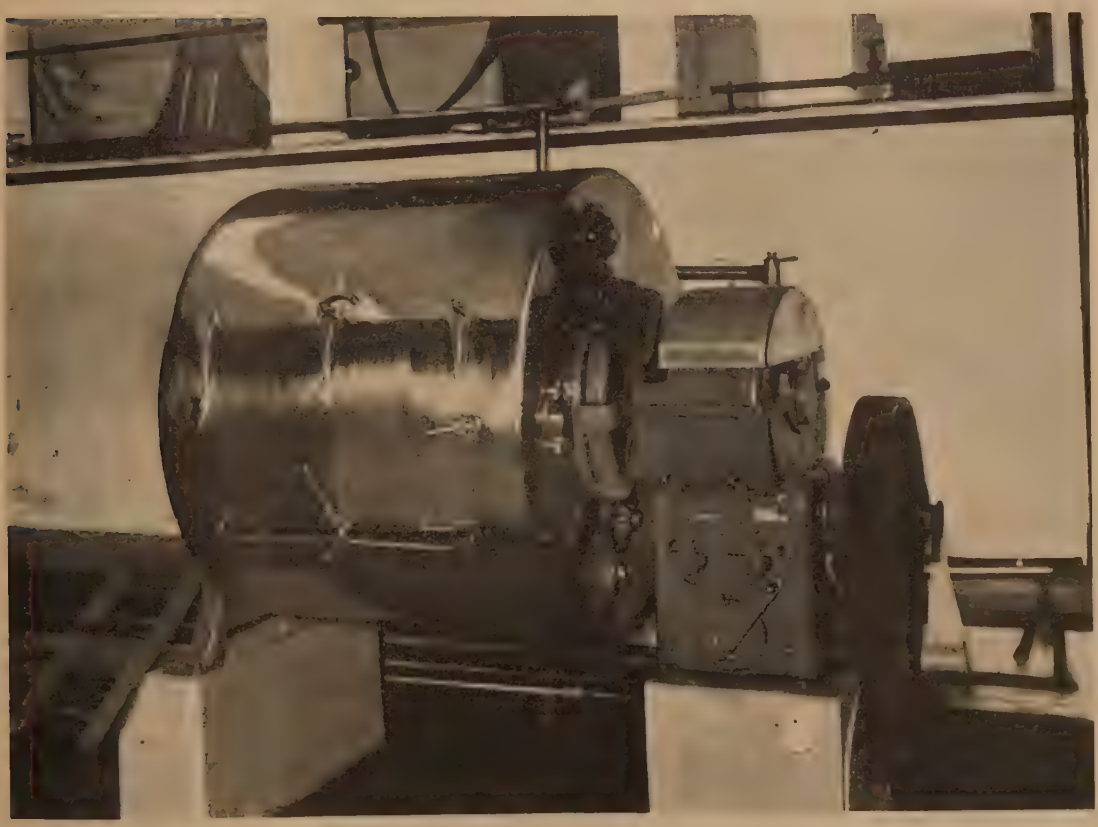


Plate 2.—A Stainless Steel Churn Barrel in Use at a Queensland Butter Factory.

and appropriate markings on their surfaces. This action was requested by the Commissioner for Prices, who desired to ensure that consumers should be readily able to differentiate the types.

Rindless prepacked cheese in consumer-size pieces has been placed on the local market by four factories. This method of packaging obviates the inedible rind typical of bandaged cheese and its more attractive appearance should stimulate the sales of cheese.

MARKET MILK INDUSTRY.

Adequate supplies of milk for consumption purposes were maintained throughout all parts of the State, due to the ability to draw additional requirements during the dry period from cheese factories which have quotas for the Brisbane milk market and to cream suppliers supplying milk to country milk pasteurisation factories.

The Port Curtis Co-operative Dairy Association opened a new milk pasteurisation factory at Gladstone and commenced the rebuilding of its Rockhampton factory. One large Brisbane factory transferred its milk pasteurisation activities to a modern wing in which automatic or semi-automatic equipment has been installed for several stages of operations; the first milk bottle crating and re-crating machine in Queensland is included in the new equipment. A rail milk tanker, the first of its kind to be used in Queensland, was put into operation for transporting milk in bulk from Malanda to Townsville. A milk clarifier installed at the Malanda factory has proved effective in reducing sediment in milk, improving its flavour and obviating "cream plug."

The Division's laboratory control and advisory services, which play an important part in the improvement of milk quality, were intensified in several directions. A particular effort was made to minimise the incidence of thermoduric bacteria in farm milk supplies. These organisms, although they do not affect the keeping quality of milk, are indicative of failure in some aspect of dairy shed hygiene; moreover, they are resistant to the temperatures employed in commercial pasteurisation. The hard waters frequently used on dairy farms accentuate the thermoduric bacteria problem; during advisory visits, officers give guidance to farmers in regard to the correct detergents to use according to the hardness of the water supplies available.

A regulation was inserted in the Dairy Produce Acts requiring milk factories to carry out the methylene blue and butterfat tests at least once weekly on each farmer's milk supply. This is designed to ensure that quality control is exercised by the factories, and the results will also be used by field officers as a basis for advisory visits to suppliers with quality problems.

HERD PRODUCTION RECORDING.

There were 24 fewer herds entered in the Pure Bred Production Recording Scheme than in the previous year, while the number of goat herds increased from three to seven. The results are summarised in the report of the Field Services Branch.

Lactations were completed by 54,352 cows in 1,412 herds in the Group Scheme during the recording year, compared with 45,734 cows in 1,266 herds in the previous year. Since the inception of the scheme in 1948-49 the average yield per cow has risen from 144 to 155 lb. butterfat. The large numbers of new herds entered each year have retarded the average rate of improvement. Many herds which have been continuously recorded have shown a steady upward production trend, one farmer having raised his herd average during eight years from 182 lb. to the very creditable figure of 348 lb. butterfat, an increase of 91 per cent.

Herd recording is appreciated by progressive dairy farmers as a medium for providing them with basic information for culling, breeding and other farm practices. The data available from the scheme are also being usefully applied for conducting various surveys which provide factual information of benefit to all Queensland dairy-farmers. Current surveys include the history and effect of treatment of mastitis in a selected number of purebred herds, calf rearing practices, calf wastage, the effect of calving intervals and the length of the dry period on production during the ensuing lactation, and factors affecting production levels on a group of farms in North Queensland.

New features introduced into the group scheme during the year were the preparation of monthly progressive totals for each individual cow, a shed sheet for keeping various records of cows, and topical notes entitled "Recording Notes." Merit registers, calf identification and sire surveys are other services given to recording farmers.

EXTENSION ACTIVITIES.

The extension programme of the Division was continued as far as restrictions on the mileage of officers for part of the year permitted. Apart from farm visits, an estimated 13,000 contacts were made with farmers by officers meeting them at sales or in the office, and by other means which called for little travel. Four sets of coloured transparencies held in each Senior Adviser's district were used by all district officers for group meetings. In addition, over 9,400 farmers attended 48 method demonstrations, 20 field days, 30 film evenings, 15 tours, 54 talks to Junior Farmer Clubs, 18 annual herd recording meetings, and addresses to discussion groups. Twenty-four papers for the *Queensland Agricultural Journal* and other journals, 36 radio scripts and 75 press releases were also prepared.

The activities of the three Dairy Extension Advisory Committees achieved worthwhile results in Department-industry co-operation in extension work.

Under the Dairy Industry Extension Grant 130 pasture and fodder conservation demonstrations were in progress among co-operating farmers. These included 92 rain-grown pastures, 23 irrigated pastures, 4 strip grazing, and 10 fodder conservation projects. On another 40 farms demonstrations dealt with the cooling of milk and cream, improved cleaning and sterilizing procedures, milking machine rubberware, solar water heaters and improved

pastures for lifting the cheese-yielding composition of milk supplied to cheese factories. Field days, individual farm visits and other means were used for bringing to the attention of district farmers the practices demonstrated and they are being widely adopted.

The "C.D.I.E.G. Newsletter" was forwarded bi-monthly to all co-operators, Departmental officers and appropriate Q.D.O. branch secretaries. Successful demonstrations, new projects and items of general interest were featured in this publication.

FARMING ASPECTS.

A gratifying improvement has taken place in recent years in the structural standards and equipment of dairy premises. During the year almost 1,000 sheds were rebuilt or modernised. The availability of ready-to-erect metal sheds and bail fittings is stimulating their erection. "Doubling-up" of milking units for the purpose of economising in building costs is also increasing. The first two "herringbone" milking sheds in Queensland were completed during the year. This type of shed is gaining in popularity in New Zealand due to the larger numbers of cows which it is claimed can be milked per man hour than in conventional sheds. Experience with the new Queensland shed seems to justify this claim and several others are being built.

Other practices which are extending amongst dairy-farmers are seasonal calving, machine stripping, in-line cleansing of milking machines, and the replacement of fuel hot-water coppers by electric water heaters in areas where electricity is reticulated. About 250 additional milk or cream refrigerators were installed on farms, bringing the total up to nearly 1,700, and many other kinds of coolers were installed as a consequence of the policy of enforcing cooling as a routine shed practice.

A total of 1,200 milking machines has been checked since the testing equipment became available about two years ago. Thirty sets of this equipment are now in use in Queensland. Officers generally make any minor adjustments after checking the machine. Faults previously unknown to the farmer are often revealed, and after adjustment milk yields often improve and milking rate is accelerated. This service is greatly appreciated by farmers.

RESEARCH PROJECTS.

The investigational work of the Dairy Research Branch has been chiefly concerned with the improvement of the flavour, keeping quality and other characteristics of milk and milk products, the efficiency of their production and processing, and improved presentation.

Investigations are being made on a keeping quality test for pasteurised milk devised in England, with a view to determining any modifications necessary for Queensland conditions. The work has also been extended to examine the influence of bacterial types on keeping quality.

There appears to be need to further develop the table cream trade in Queensland. The optimum temperature-time relationships for pasteurisation, a test for efficiency of pasteurisation, bacteriological standards, and keeping quality are being studied.

Further work was carried out with a view to producing reconstituted milk which would be indistinguishable from normal pasteurised milk. Butteroil and skim-milk powder continue to be the main ingredients, but other milk products were included. The most promising results were obtained by incorporating 10 per cent. of buttermilk powder. This project has been undertaken because of the possibilities which could open up for the sale of Queensland butteroil and skim-milk powder to South-east Asian countries, in several of which milk reconstitution plants have already been erected. The proximity of Queensland to these countries should place Queensland factories in a favourable position to meet the anticipated increasing demands for raw materials. Work has also been initiated on the production of reconstituted cream. If a high-quality product could be developed it would overcome the difficulty of satisfying the market for table cream during periods when all the available fresh milk supplies are required for consumer demands.

The investigation aimed at maintaining the solids content of milk during the period from July to November, when it normally shows a sharp decline, has revealed that grazing the cows on a lucerne–green panic pasture will arrest the decline.

Studies on the keeping quality of butter have shown that for salted butter good keeping quality is achieved if the pH is within the range of 7·8 to 8·2, but there is an increased percentage of butterfat lost in the buttermilk. In contrast, unsalted butter keeps best if its pH is from 6·8 to 7·0. The investigations have been extended to cover the effect of traces of metallic contamination, intensity of cream pasteurisation and storage temperatures on keeping quality.

The flavour chemistry of dairy products is being studied by means of paper chromatography and electrophoresis techniques. These open up a fresh field for studying the various complex constituents of dairy products which are associated with flavours. Interesting trends are already being shown from this work.

Studies on coliform bacteria in cheese disclose a tendency towards a correlation between high coliform contamination and quality deterioration. Papers have been prepared for publication on the inhibition of acidity development in cheese-making during the winter months and the sampling of cheese factory milk supplies and whey; the latter form part of a long-term investigation of factors affecting cheese yields.

Factory-scale investigations in conjunction with two factories have shown that cheese of superior quality is produced if the moisture content of the cheese is kept to a somewhat lower level than that previously adopted in Queensland factories. The ratio of moisture to solids-not-fat in cheese largely governs the biological reactions during ripening.

Other investigations were concerned with homogenised, clarified and sterilized milk, the suitability of coloured waxes for cheese, steam

utilization at factories, milkstone removal from dairy equipment, a solar water heater for dairy shed use, and milking machine rubberware.

LABORATORY CONTROL SERVICES.

There is close collaboration between the Field Services and Research Branches in implementing schemes for the improvement of the quality of dairy products based on laboratory control schemes. A pleasing feature in regard to market milk quality was a noticeably lower percentage of milks which failed the methylene blue standards. Follow-up work by the field staff on laboratory thermoduric bacteria counts in milk has been successful in reducing the incidence of the trouble. The average fat content of samples of bottled pasteurised milk was 3·80 per cent. and the solids-not-fat content 8·56 per cent.; these figures reveal that milk of satisfactory compositional quality is supplied to consumers. A total of 2,511 freezing point tests was made on samples of milk previously screened by rapid platform tests by field officers, and 20 farmers were prosecuted for having added water to milk.

Over 750 cheese starter cultures were distributed from the Toowoomba laboratory and information on starter control was periodically distributed to cheese factories and field staff. More than 25,000 tests were made on 2,851 samples of butter and the results, with appropriate comments, forwarded to factories and field officers. A total of 7,587 miscellaneous samples was submitted for chemical analysis, and 12,998 pieces of dairy glassware were tested for compliance with the standards prescribed under the Dairy Produce Acts.

STAFF.

The loss of two graduate officers and four field officers during the year, following on similar losses in recent years, has handicapped the services rendered by the Division. These officers had reached a stage of efficiency and experience which any replacements can only attain after at least a number of years' service.

The staff have, generally, performed their duties with zeal, a pleasing feature being the initiative shown by some officers in developing extension programmes in their districts. These efforts are strengthening harmonious officer-farmer relationships and stimulating the furtherance of efficient practices on farms and in factories.

DIVISION OF MARKETING.

Director: Mr. H. S. Hunter.

Most of the rural industries have been conscious throughout the year of the continued narrowing of the gap between costs and prices, but fortunately this does not apply to the great wool industry, which has experienced a buoyant demand from overseas buyers. Furthermore, Queensland with total offerings of some 798,906 bales was able to exceed all previous wool quantity selling records.

Neither did the State's major farm crop, sugar cane, find itself in serious difficulty. The world price for raw sugar increased from 3·25 cents per lb. (£s.26 per ton) in 1956 to 6·15 cents per lb. (£s. 49 4s. per ton) in June 1957. The whole of the 1957 season's Australian production, estimated at 1,249,300 tons 94 n.t. sugar, of which Queensland will produce an estimated 1,215,300 tons, will be accepted by the Sugar Board for marketing consequent upon an expansion in the marketing outlet for world price sugar. The price for the portion (300,000 long tons) sold at a negotiated price to the United Kingdom rose to £s.42 3s. 4d. c.i.f. per ton from £s.40 15s. per ton in 1956. Sales at the world price included 100,000 tons to Japan. The industry was granted an increase of 1d. per lb. in the domestic retail price of refined sugar in May 1956 as a set-off to rising costs.

The other industries, as may be seen from the report of the Marketing Branch, are for the most part in less happy circumstances. Growers in such industries not only have to contend with pressures arising from rising costs and falling commodity values, but they have increasingly to adopt a business-man's attitude towards their calling because of the need in this mechanical age for increased capital investment in their farms to equip them with the requisite implements and machines.

AGRICULTURAL ECONOMICS.

Departments of Agriculture throughout the English-speaking world are fully aware of the farmer's need with respect to agricultural economics. He must not only gain some idea of the structure of his industry, but he must place the management of his farm upon as sound a business basis as possible so that his farm management decisions may be made with a due appreciation of the costs entailed in any particular farming practice or enterprise and the influence of various factors upon economic efficiency.

There is, particularly, recognition in Departments of Agriculture that facts resulting from agricultural research when conveyed to farmers by agricultural extension workers must now be explained complete with appropriate economic information concerning any recommended farming practice.

This aspect of the question was included in the discussions at a symposium on agricultural extension held in June with administrative and extension officers of this Department contributing.

To supply these needs it is felt that producers in the rural industries must have access to economic information of a kind which will have to be ascertained for them by economic survey and research work. It is evident also that the agricultural economist must be closely associated with those who brief the agricultural extension officer.

In my report last year reference was made to certain agricultural economics work performed in addition to the Division's marketing activities. This trend has been continued and expanded as staff and facilities have permitted. In collaboration with the Council of Agriculture and the Committee of Direction of Fruit Marketing, the Division is currently engaged upon an economic investigation into the pineapple growing industry. Travelling and transportation expenses are being borne by the industry. The investigation is designed to bring out a picture of industry structure which will include such things as the extent to which farmers in different districts and different farm size groups are using various cultural methods, and any correlation between profitability and such variables as capital, area, labour, and production output per labour unit. The survey was designed also to reveal any changes that may be taking place in the pincapple growing industry; for example, any expansion or contraction in a district or changes in production pattern; also what farmers themselves were thinking about prospects and problems of the industry.

Farmers were interviewed in all major growing districts in Southern, Central and Northern Queensland. The report on this survey is nearing completion.

Some other projects have had to be deferred because of the loss by resignation during the year of Mr. H. Spring, one of the Marketing Officers employed, part time, on agricultural economics investigations.

The development of an agricultural economics section in the Division will be furthered by the visit to U.S.A. of Mr. C. H. P. Defries, Assistant Director of Marketing. Mr. Defries left in May to study the methods used in the application of economics to farm management studies at the Universities of North Carolina, Missouri and Michigan. The visit has been arranged under a United States Government 60-day Leader Specialist Grant. A contribution from the Commonwealth Extension Services Fund will enable Mr. Defries to extend his stay by a further month to study extension methods in relation to agricultural economics at other American institutions and in Canada.

Consciousness of the need for more agricultural economic research was reflected in the gathering in conference in Sydney in February

of economics officers from Departments both Commonwealth and State and commercial institutions associated with the rural industries. The conference led to the establishment of The Australian Agricultural Economics Society.

MARKETING.

The marketing trends throughout the year for pastoral and agricultural commodities are outlined in the report of the Marketing Branch. The operations of the marketing boards, of which there are 17, will be reviewed in detail, when audited figures are available, in a report which is made yearly by the Director of Marketing to the Minister as required by *The Primary Producers' Organisation and Marketing Acts, 1926 to 1957*. Copies of the report, which will contain statistical and other information, will be available on application to the Department of Agriculture and Stock.

The Butter Marketing Board in June sent its Manager, Mr. G. W. Coombs, to Japan with the object of establishing there a market for Queensland butter and butterfat products. The visit was coincident with the despatch of a Commonwealth Mission to the United Kingdom, the main overseas market for Australian dairy products, where prices for Australian butter had receded from 400s. stg. per cwt. in 1955 to 247s. stg. per cwt. in the early part of 1957. The General Manager, Mr. C. Sheehy, was included in this mission in his capacity as Chairman of the Australian Dairy Produce Board.

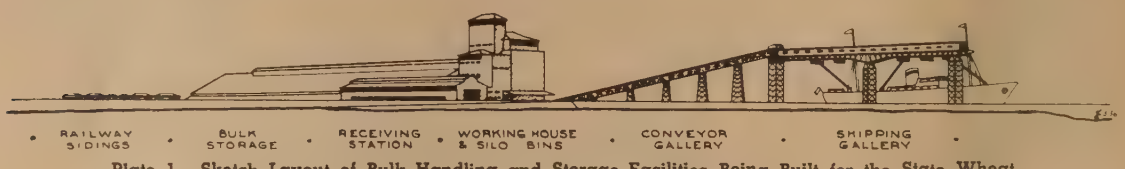


Plate 1.—Sketch Layout of Bulk Handling and Storage Facilities Being Built for the State Wheat Board at Pinkenba.

The Butter Marketing Board had previously sent Mr. Coombs to countries of South-east Asia in 1954, when contacts were made with purchasers of our butter and ghee products and interest was aroused in the possibilities of recombined milk for those areas. As a follow-up the Board's Chief Chemist went to Singapore, Malaya, Thailand, Burma and Hong Kong in 1956 and re-established personal contact with the Board's agents and buyers in those countries.

A new building for the Egg Marketing Board at Kelvin Grove Road, Normanby, is expected to be ready for occupation in February 1958. After its completion the Board will be able to centre all of its activities at Normanby instead of continuing their present unsatisfactory and uneconomical division between main premises in Makerston Street and the old Normanby building. The new premises, to cost approximately £290,000, will provide the Board with modern office and egg-handling facilities, with up-to-date equipment, including needed plant for the pasteurising of egg pulp.

The State Wheat Board is proceeding with a programme of building to provide facilities for the bulk handling and storage of wheat. Country elevators of an aggregate capacity of 2,640,000 bushels now have been erected at nine intake centres, and the Pinkenba bulk storage and shipping terminal, which will have a storage capacity of 1,300,000 bushels, is in course of erection.

The country elevators consist of single-bin units, each of 220,000 bushels capacity and a loading and discharging rate of 120 tons per hour, at Brookstead, Bongeen and Macalister; multi-bin silos of 220,000 bushels capacity with a handling rate of 150 tons per hour at Millmerran, Cecil Plains and Clifton; and double-unit multi-bin silos of this type (each 440,000 bushels capacity) at Dalby, Jimbour and Malu.

The Pinkenba terminal, which will consist of a large 1,000,000 bushel horizontal store, a nest of vertical silo bins of 300,000 bushels capacity around a working house, and a conveyor system working in an elevated gallery extending a distance of 596 feet across the railway line and the wharf to the chutes which discharge into the ship's hold, is expected to be in operation for the 1958 harvest. The cost of this terminal will exceed £1m.

The Director has been associated throughout the year with discussions between the representatives of Commonwealth and State Departments and the wheat, flour and bread interests relating to proposals for the classification and segregation of higher quality wheats. The subject is one of some complexity and difficulty in the other States, but Queensland, with a high general level of wheat quality, already is selling on local and overseas markets at a premium over the price for f.a.q. wheat. Incidentally, agreement was reached during the year that the average premium to be paid by Queensland millers will be increased from 2¾d. per bus. to 6d. per bus. commencing with wheat of the 1957-58 season.

Unfortunately, production of Queensland wheat declined for various reasons to less than 8 million bushels and we failed to maintain our promising trade connection with Japan for premium wheat. We failed also to maintain a continuity of supply of premium quality flour to markets recently established for it in the United Kingdom and in South-east Asia.

Mr. Hunter was appointed Acting Chairman of the State Wheat Board for a period in 1956 during the absence overseas of the Chairman, Mr. A. R. Archibald.

The Primary Producers' Organisation and Marketing Acts were amended in 1957, the Governor in Council being empowered to strengthen the policing powers of Boards to

deal with illicit trafficking in commodities, mainly to enable Boards to differentiate between interstate trade and trade which bogusly claims to be interstate in character.

The Potato Marketing Board, which ceased operating on Mar. 31, 1954, was finally dissolved by Order of the Supreme Court on June 24, 1957. A residue of £9,259 from the Board's funds was paid into a Trust Fund, as required by the Act, to be used for the benefit of the potato industry.

The pineapple industry has reached a stage when the post-war shortages have been overcome and conditions of oversupply are developing in the main overseas markets. This situation led to the holding in London in May 1957 of a conference of industry representatives of British Commonwealth pineapple exporting countries at which it was decided to ask the British Government for protection against imports from foreign competitors. Australia has been less affected than some other British Commonwealth producers as our exports to the United Kingdom have been confined to choice grades.

The record of the Queensland pineapple canning industry since the establishment of the C.O.D. Northgate cannery in 1947 is one of great expansion. The throughput of pineapples has almost trebled since 1947-48, when 851,548 cases were processed. The figure for 1955-56 was 2,452,077 cases.

The year 1955-56 was an important one for the pineapple canning industry in North Queensland. Following the failure of the co-operative cannery project at Cairns, the C.O.D. in 1955 came to the aid of the Northern growers. Processing of the summer crop by the C.O.D. in the Co-operative's Cairns cannery proved uneconomic and consequently the 1956 May-June crop was transported, with the help of rail freight concessions, to the C.O.D. factory at Koongal.

The northern industry has been given further encouragement by the State Government, which has undertaken to guarantee £250,000 for the erection of a modern cannery in North Queensland and an additional £250,000 working capital when production for canning reaches 4,000 tons of good canning quality pineapples per year.

The Council of Agriculture has continued to watch the interests of the rural industries, particularly by appearances before tribunals such as the Tariff Board and the Arbitration Court in respect of matters threatening a further increase in costs of production.

STANDARDS.

It is with deep regret that the death of Mr. F. B. Coleman on Nov. 27 is recorded. Mr. Coleman had been associated with the Standards Branch since his appointment to the Public Service in 1919. His contributions to the techniques of seed testing and to the development of the Branch, in which he had held the position of Branch Head since July, 1935, have redounded to the credit of the Department.

Mr. Coleman has been succeeded as Standards Officer by Mr. A. A. Ross, formerly Horticulturist, and Mr. A C. Peel has been appointed to the newly created position of Assistant Standards Officer.

The Agricultural Standards (Seeds) Regulations were introduced during the year to replace the regulations previously in force under the repealed Seeds Act. Action was also taken to prepare draft amendments to *The Fruit and Vegetables Act of* 1947 in order to make it apply more effectively to modern marketing methods.

There was considerable development in the seed certification scheme during the year, the production of certified seed of hybrid maize, grain sorghum, sweet sorghum, Sudan grass and tomatoes having shown substantial increases over previous years. The scheme was expanded to include pasture species, and arrangements have been made for the production of certified buffel grass seed during the 1957-58 season. Greater demand for small grains such as canary seed and millets by the bird-seed industry of the United Kingdom, Europe and the United States required a considerable number of examinations of export consignments. It has been proposed that fixed standards be applied to these grains for export to ensure a quality acceptable to overseas importers.

The report of the Standards Branch reveals that during the year 10,204 samples of seed of all kinds were examined for the purpose of issuing certificates of quality. This was a decrease of 1,231 when compared with the previous year. The absence of two inspectors on long service leave was mainly responsible for this. However, there was an increase of 21 per cent. in the number of samples of grains analysed for export. The number of samples of small grains (canary seed and millets) increased from 1,335 to 1,488.

Inspectors in the fruit and vegetable markets were fully extended in dealing with gluts of beans and tomatoes during the autumn of 1957, and the extremely high prices prevailing for potatoes last spring caused a flow of large quantities of sub-standard produce on to the market.

CO-OPERATION.

Three new co-operatives were registered during the year under The Primary Producers' Co-operative Associations Acts. All were in respect of the meat industry. Co-operatives registered under these Acts had a turnover during the year ended June, 1956, exceeding £52m. The book value of their fixed assets totalled £13m. and they held reserve funds aggregating £4·7m. Members' funds contributed as share and loan capital approximated £8m. Distribution of profits to members in the form of bonuses and dividends totalled £460,000.

DIVISION OF PLANT INDUSTRY: BRANCH REPORTS.

AGRICULTURE BRANCH.

Mr. W. J. S. Sloan, Director of Agriculture.

In reviewing the activities of the Agriculture Branch for the year 1956-57, two features dominate the scene. These are, first, the predominantly dry conditions throughout the agricultural districts of south and central Queensland; and secondly, a change in the Branch's approach to its extension commitments, imposed partly by design and partly by force of economic circumstances.

Of the effects of dry seasons more will be said in the sections relating to crops and pastures. From the national viewpoint, the most important feature was that an overwhelming majority of stock-owners in the southern half of the State entered the winter of 1957 with inadequate pasture and virtually no fodder reserves.

Over 350,000 acres of winter grazing crops would normally have been planted. This year, owing to the failure of the autumn rains, little of this planting occurred; of those crops which were established, few could be grazed without destroying the stand.

Stock-owners who have had to purchase fodder at the prevailing high prices may need more than one good year to recoup these costs. At the same time, they realise that a continuation of the dry weather could still impose the additional financial burden of stock losses.

While positive progress can be reported in the attitude of farmers and graziers toward pasture improvement (both irrigated and dryland) and towards a better balanced land use, the total effect has to date been insignificant in improving the stability of the State's production. It is only by a wide-scale application of conservation to the produce of dryland crops and pastures that any appreciable improvement can be expected.

The critical factor seems to be that stock-owners are not yet convinced of the economics of fodder conservation, particularly on a long-term basis. Suitable crops are available for the purpose, and methods of mechanically handling them have been greatly improved in recent years. An economical means of applying the available knowledge must now be found.

With regard to the Branch's extension activities, it has long been evident that in this country of vast distances and scattered population a service based entirely upon individual farm visits is impossible of achievement. For this reason, increasing stress has been placed upon the mass methods of imparting information. These methods include the frequent use of press and radio, with emphasis also on meetings, field days, tours and other opportunities for group activity.

This trend was given considerable impetus during 1956-57 by a serious reduction in field officers' travelling, necessitated by budget restrictions. While these restrictions caused much inconvenience, they did serve a useful purpose in compelling field officers to make a more critical evaluation of their district needs and to develop the greatest possible efficiency in their extension methods.

While it is impossible in such a short space of time to assess the results of this altered approach to extension, some instances of apparent success and failure can be cited. Success may reasonably be claimed in relation to such matters as the increased use of better seed and improved varieties; the increase in pasture sowings in both agricultural and pastoral areas; improvement in the grading and presentation of tobacco leaf; and the greater realisation of the necessity for soil and water conservation. Failures can also be found, the most obvious being in the field of fodder conservation.

It is but natural that a curtailment of services to individual farms should bring a quick reaction from rural communities and organisations. While many protests were of a general nature, strong and continued reactions were received from two main groups—(i) those requiring technical assistance in relation to soil conservation or irrigation measures, and (ii) those involved in the production and distribution of certified seed. Both classes of service demand individual farm visits, and wherever possible such demands were met.

One of the most pleasing features of the year has been the evidence of a widespread demand for high quality seed. During the year a group of the principal seed merchants of the State approached the Branch with strong representations to widen the scope and volume of seed certification. This indicates a major change in attitude within the past decade, a change involving the whole farming community and projected thence throughout the seed-handling industry.

FIELD CROPS.

The year under review has provided a striking contrast to the two preceding seasons of generally bountiful rainfall. In most agricultural districts of south and central Queensland, rainfalls have been below average at all stages except the June-July period and the later part of December. A feature of much of the rainfall contributing to the year's total has been its relative ineffectiveness. Numerous falls of less than half an inch, though adding up to reasonable monthly totals, have been insufficient individually to penetrate to the root zone of crops.

On the face of it, therefore, it is somewhat of a surprise to find that crop yields have been generally well maintained, and in some cases compare more than favourably with those of the previous seasons. The answer, of course, is "stored water".

Most winter plantings in 1956 were made on ample stored water for the full requirements of the crops. This was a natural corollary to the high rainfall over the preceding half-year and did not depend on farmers' skills in fallow management. Although large areas of the Darling Downs received no effective rainfall during the growing season, many excellent crops were harvested and the estimated average wheat yield is appreciably over 20 bus. per acre.

The dry growing season was unfavourable for the development of cereal rusts and other diseases, and frosting was probably the main factor responsible for reducing yields. Two brief periods of severe frost, one in August and one in September, caused serious visible damage to winter cereals, linseed and safflower. In addition, they were probably responsible for considerable undetected damage, which nevertheless reduced the yield potential. Crops generally were harvested under ideal conditions and provided bright, dry samples of grain.

During the summer of 1956-57, farm management *did* play an important part in successful crop production. The season was generally dry except for one good soaking rain-group in late December. Farmers who planted their summer crops on well fallowed land (i.e., land which had been under fallow for approximately 12 months) produced excellent yields. In contrast, those who attempted production on hastily prepared ground all suffered to some degree from drought.

The summer season was thus one of contrasts. In some districts crops could nearly all be classed as very good or very poor according to whether the land had been effectively fallowed or not. The few intermediate crops were generally the result of isolated lucky storms.

The main feature of the cropping pattern was the swing away from wheat which was referred to in last year's report. The estimated reduction in grain wheat area from the 1955 to the 1956 season was about 200,000 acres, or approximately 35 per cent. While some of this reduction was attributable to excessive water at planting time, most was due to the dissatisfaction of farmers with current returns from wheat.

This leeway, which occurred mainly on the Darling Downs, was largely made up by increases in the acreage of other winter crops (e.g., linseed canary seed, and safflower) and of certain summer crops (e.g., soybeans, navy beans, and cotton).

Another feature of the past year has been the expansion of the markets for certain minor crops such as canary seed, millets, soybean and safflower. In the instance of the last two crops, this expansion is gradual and of no great significance as yet. However, such trends, coupled with the recent extensive increases in barley acreage, have posed new problems, particularly in the fields of crop improvement, strain testing, and field advisory services.

The summer season has been generally favourable for certified seed production of sorghums, Sudan grass and hybrid maize. Where dry-farming methods have been applied (or irrigation used on hybrid maize) excellent yields have been harvested, and the seed has been of very good quality. Agriculture Branch officers have been responsible for the field production of an estimated 38,000 bus. of sorghum and Sudan grass seed from 1,000 acres, and 12,000 bus. of hybrid maize seed from 310 acres.

Wheat.

The principal features of the 1956 wheat season were (1) the high reserves of soil moisture, (2) the dry season, (3) the damaging frosts of August and September, (4) the incidence of crown rot, and (5) the comparative freedom from rusts. Under these conditions the major factor restricting yield was undoubtedly frost damage, with crown rot probably next in importance.

The general pattern of results from varietal and strain trials indicates that the season has been more favourable to Gabo than were the much wetter seasons of the previous two years. Festival, on the other hand, did not "finish" as well as in previous years, and did not yield up to expectations. Spica has proved itself the most versatile quick-maturing wheat in southern Queensland, being equally prominent in wet and in dry seasons. In addition, its gluten quality makes it one of the most acceptable bread wheats in cultivation in Australia today. Its only serious shortcoming is the toughness of its head, which makes threshing difficult except under ideal conditions.

In some of the strain trials conducted at Hermitage Regional Experiment Station, important yield differences were clearly correlated with frost injury. The season has thus provided some useful indications with respect to susceptibility to frost damage. A Kenya x Seafoam progeny which has in recent years been very prominent in yield trials gave a mediocre performance during last season. This may well indicate a serious weakness in an otherwise promising progeny which had been considered for naming and release.

From the standpoint of crop improvement, the most important result of the year's testing was the performance of certain selections from the Lawrence x Gabo cross. At different centres on the Darling Downs and elsewhere these progenies gave evidence of good field characters, high yield potential, and a capacity to resist frost injury. They had previously been shown to be stem-rust resistant and of good flour quality. In the latter respect, the progenies tested could be classed as of Lawrence quality or of Gabo quality, with little evidence of any intermediate types. Current work will be concentrated on this group to determine the best for release and naming.

As a result of a back-crossing programme, a new strain of Puora, into which stem-rust resistance had been bred, was available for testing this season. While the season did not allow of rust resistance being put to the test, it did provide evidence that the back-cross line was in no way inferior to Puora in yield or in field characters generally. Multiplication of this line will now take place, as a potential replacement for the old Puora in this State.

Investigations into soil fertility problems on the Darling Downs and their relationships to wheat yield and quality have been intensified. While much of the open plains country shows no response to fertilizer, even after 50 years or more of continuous cultivation, certain problem areas have now begun to appear. One such area between Pittsworth and Millmerran was identified by the Department's Cereal Chemist as producing low protein wheat consistently. Applications of nitrogenous fertilizer to such soils have been responsible for marked increases in both yield and quality of grain. Studies are also being made of phosphorus deficiency in some of the "box" soils near Bowenville; of the effects upon wheat of lucerne and other legume leys; and of the effects of nitrogen fertilization on grain yields following the feeding-off of a crop.

Oats.

Reports from all districts except the Atherton Tableland highlighted the excellent performance of Bovah as a grazing oat during the 1956 winter season. At all centres, crown rust was severe during some stages of growth and Bovah was the only commercial variety to show effective field resistance. In field trials, Benton also showed useful field resistance to rust and showed an even higher grazing capacity (for coastal areas) than Bovah.

On the Atherton Tableland, Bovah was heavily rusted for the first time, indicating the probable occurrence there of a new rust strain. The existence of this new strain of crown rust in Queensland underlines the difficulty of the plant breeder's problem in breeding rust-resistant oats, and the necessity for having available as many different sources of rust resistance as possible.

Barley.

While malting barley advanced in 1955 to a position threatening wheat's supremacy in the winter cereal field, there is no present indication of any further increase in its popularity. The area under crop in 1956 was comparable with that of the previous year and the total production was also very similar.

Overseas buyers have indicated that in barley a high protein content is not required, as this is generally associated with a high percentage of blue and steely grains which are regarded as undesirable. A high bushel weight is apparently the main requirement sought by the market. Such leads indicate clearly the relative positions which wheat and barley should occupy in the farm economy. Wheat should be preferred on the more fertile soils, or should be so placed in a crop rotation scheme to take first advantage of improved fertility due to the use of legumes or nitrogenous fertilizers. The logical position of barley is on the less fertile soils or further down the crop rotation than wheat.

Maize.

While the 1956-57 season was far from ideal for maize production, results have been better than anticipated. This applies to production of hybrid seed as well as of bulk grain. One of the reasons for this is the entirely new degree of drought tolerance conferred on this crop by the general use of hybrids. Useful yields have this season been obtained from crops which in the days of open-pollinated varieties would have been completely written off. This is a somewhat unexpected benefit resulting from the development of hybrids, since, on theoretical grounds, it would be expected that their superiority would be most pronounced under conditions conducive to high yields.

The current series of Departmental hybrid yield trials was continued last season but is now nearing completion. The object of these trials is to provide reliable varietal recommendations for all maize districts of the State. The most interesting feature of the 1956-57 series was the introduction of Q.23 (m.s.) for testing against standard Q. 23. The former is a modified Q. 23 built up from male-sterile female parents. The great benefit of this type of hybrid is that it can be produced commercially without the necessity for the laborious and expensive detasselling process.

An important advance on the hybrid seed production side has been the installation, by two of the major producers, of grain drying equipment. The use of such equipment enables the crops to be harvested weeks ahead of the normal time, thereby minimising losses due to insect and bird damage, disease and mechanical harvesting. So great are the benefits already derived from drying of seed maize that the economic aspects of its application to bulk grain harvesting are well worth investigating.

Sorghum.

For reasons previously discussed, the season was a very mixed one for sorghum production. Wherever the land had been adequately fallowed, yields of 45–90 bus. per acre were commonplace; where land had not been fallowed for more than a few months, yields of 0–20 bus. per acre were more usual. Seldom has the value of a "season in the ground" been so convincingly demonstrated for a *summer* crop in Queensland. One crop of Alpha in the Cecil Plains district yielded 45 bus. per acre after having received no effective rainfall during growth.

In some of the more marginal grain producing areas (e.g. Wandoan-Taroom and the Central Highlands) a further lesson was forcibly brought home. Many areas planted at a rate in excess of 8 lb. per acre were fit only for feeding off, while crops sown at 5 lb. or less were generally successful. The highest average yield in the Wandoan district (63 bus. per acre) was from a crop

Plate 1.—A Darling Downs 80-acre Field of Certified Alpha Grain Sorghum which Averaged 99 bus. Per Acre.

of Alpha sown at the rate of only 3 lb. per acre. It is conceivable that, under more favourable conditions, heavier stands would give higher yields. In most years, however, and particularly in the drier grain producing districts, adequate spacing of plants in the field is an excellent insurance against a dry season.

Another important feature of the sorghum crop, especially in the less frost-susceptible districts, is the value of the stubble for stock feeding during dry times. In the Central Highlands district, where the crop ratoons very successfully, this feature is of considerable economic importance. Here, under certain conditions, the carrying capacity of the stubble and regrowth may be up to five times that of well-managed native pasture. It is because of its capacity for ratooning, rather than its grain yield potential, that Alpha has rapidly become the major variety in such districts.

Canary Seed.

A feature of the last two seasons has been the amazing increase in canary seed production. While this demand has been brought about by abnormal conditions in other producing countries, the market is one which is worth retaining. This can be done only if the quality of the product is satisfactory. While it was previously held by farmers and merchants that the main deficiency in Queensland canary seed was in the size of the grain, there is now very little doubt that general purity and freedom from broken and dehulled grains are of far greater importance than mere size.

Freedom from broken grain and impurities can be effected by careful grading. However, the removal of dehulled grain cannot be economically managed at this stage. This problem therefore requires to be tackled at harvest time on the farm. Questions of strain testing, seed size and dehulling of grain are being examined currently by the Department.

Linseed.

Linseed has continued to gain ground at the expense of wheat, and in 1956 occupied over 100,000 acres. Departmental trials have shown that the yield per acre can be appreciably lifted by substituting other varieties for Walsh. Plate was one of the newer varieties which had been considered for this purpose, but recent tests have indicated that this variety is somewhat deficient in both oil quantity and oil quality. However, past experience indicates that it should be possible within one or two years to liberate other varieties of equal yield capacity to Plate and of an oil quality acceptable to the processors.

Tobacco.

Northern tobacco districts suffered severely from unfavourable tobacco growing conditions during the past season, while the southern districts enjoyed one of the best seasons on record. Several farmers in both zones lost entire crops through storm damage and hail. In addition, in North Queensland, strong winds caused a considerable amount of crop lodging with attendant losses of yield and quality.

Blue mould in its various forms was undoubtedly the main factor reducing yields throughout the State. In the northern districts, in addition to the usual early field outbreaks, there were very severe attacks in November and to a lesser degree in December. On both occasions leaf almost ready for harvesting was damaged, and leaf well up on the plant was affected sufficiently to make it unsaleable. The severity of these attacks can be gauged by the fact that many farms with 5-7 acres of irrigated tobacco were able to market only 1,000-2,000 lb. of cured leaf. Even if the highest price were obtained for the whole of such a crop it could not give an economic return to the grower.

Commercial seed production by the Department embraced four major varieties at five sites throughout the State.

Lucerne.

Losses in planting due to prolonged waterlogging over the past two seasons were replaced this autumn in the main lucerne growing areas in the Moreton district. Present plantings in this district approximate 25,000 acres, and an interesting point is that a quarter of this area is being used solely for grazing. As a grazing crop and pasture component, lucerne is giving a satisfactory performance under a wide range of climatic conditions in the 20-30 in. rainfall areas.

Cotton.

The average yield of seed cotton for the 1955-56 season was 405 lb. per acre, and 3,046 bales of lint were obtained from just over 9,700 acres. The lint percentage was somewhat lower (37.09 per cent.) than last season's record figure of 38.29 per cent. The quality of the lint was impaired by wet weather during harvesting; 60 per cent. of the lint was suitable for knitting and weaving, while the remaining 40 per cent. was of cordage and bedding grades.

Seed sufficient to plant about 18,000 acres was supplied for the 1956-57 season. Because of the failure of planting rains during the spring, this area of crop was not even approached, latest estimates being that only 9,000 acres will be harvested this season. On the western Darling Downs a planting of 8,000 acres had been proposed, but only 1,200 acres was actually sown, and over half of this area was lost during the hot summer months.

Interest in this crop in the grain-growing areas of the Callide and western Darling Downs districts remains high. An increase in the number of mechanical pickers available has helped to solve the labour problems associated with harvesting the crop.

Potatoes.

Seasonal conditions for the spring crop in the main potato-growing areas (Lockyer, Fassifern, and Brisbane districts) were generally good. Frequent irrigation was necessary, however, and late frosts caused damage in some crops. Yields averaged 4½-5 tons per acre and prices were at a satisfactory level (£30-£70 per ton).

Good returns from the spring crop resulted in an increased acreage for the autumn crop—approximately 10 per cent. above the normal area of 4,000 acres. Growing conditions were similar to those for the spring crop and similar yields were obtained.

The varietal position has not significantly changed; 80 per cent. of the plantings are Sebago, with Exton and Sequoia making up most of the remaining 20 per cent. Walanga, a new variety from New South Wales, has been tried extensively over the past few seasons, but has proved unsatisfactory because of lower yields.

The use of fertilizers has become a standard practice with this crop. A complete mixture is applied at planting at the rate of 1½-4½ cwt. per acre, followed in most cases by a side dressing of ½-1 cwt. of sulphate of ammonia per acre at flowering.

Onions.

Good prices, up to £80 per ton, were obtained for the 1956 crop of approximately 12,000 tons from 2,000 acres.

In an endeavour to catch the early market some plantings of the 1957 crop were made in mid-February. The prolonged dry, warm autumn caused these plantings to bulb prematurely, and most areas had to be ploughed out. The very satisfactory returns from last season's crop resulted in increased plantings up to 2,500 acres. The Early Lockyer White and Early Lockyer Brown varieties are preferred, but seed supplies of these varieties have been short. In some cases seed of any available variety has been planted.

Apart from the main onion growing areas, such as the Lockyer, Fassifern and Brisbane districts, interest in this crop has been maintained on the Darling Downs, where some large individual acreages have been grown. Interest is also being shown in the South Burnett district. Under this wide range of conditions weed control problems are of primary importance, and field trials of available weedicides are being undertaken.

Peanuts.

Because of unfavourable weather during the harvesting period for the past two seasons, the area under peanuts declined from the 1955-56 sowing of over 31,000 acres to about 25,000 acres. Except in the North Queensland areas around Mareeba and Atherton, the crop suffered from hot dry summer and autumn conditions and failed in some areas. The dry conditions, however, were excellent for harvesting. A production of 9,000 tons is expected.

Mechanisation of the industry proceeded a step further during the year with the production of a prototype stooking machine which picks up plants from windrows and forms them into stooks. This will expedite field handling of the peanuts and fill the gap previously supplied by seasonal labour, which is now scarce. A number of these machines will be available next season.

Considerable interest is being shown in artificial drying of peanuts. Three farm drier units are operating in the Atherton area and more are expected for next season's crop. Investigations into the factors involved in the artificial drying of peanuts are being undertaken at Kingaroy in conjunction with the Peanut Marketing Board and the Farm Technology Section of the Commonwealth Department of Primary Industry.

PASTURES.

The dry conditions experienced over much of southern Queensland during 1956-57 will provide the first real test for many areas of sown pastures. Their behaviour under these conditions will do much to influence the opinions of primary producers on the value of improved pastures.

The basic pasture problems facing the stock-owner remain the same—that is, even in more favourable years there is a short period of vigorous growth followed by a long period when only poor quality forage is available for the grazing animal. However, methods of improving the nutritional status for animals are available for many areas. These methods, which are at present under study, include:—

(*a*) The development of sown pastures based on species such as buffel grass, Rhodes grass, guinea grass and centro, which will extend the grazing season by 2-4 months each year. (Species such as these will also provide roughage of higher digestibility than most native species even during the dormant periods.)

(*b*) The use of lucerne either in mixture with suitable grasses or grown alone to provide high quality forage and/or hay.

(*c*) The use of fertilizers in suitable areas to increase the yield and quality of grass growth.

(*d*) The development of irrigated pastures, which should provide protein-rich feed throughout the year.

(*e*) The management of existing native pastures in a more efficient way.

Interest in pasture improvement has been maintained by primary producers and associated commercial firms throughout the year. Financial assistance by the Australian Dairy Produce Board for dairy pasture

Plate 2.—Subdivision of Pasture Areas Allows More Even and Rotational Grazing, Thereby Extending the Grazing Season.

Plate 3.—Liquid Manure Contains Valuable Plant Foods Which Stimulate Growth of Pastures.

investigations has been continued, while Shell Chemical (Aust.) Pty. Ltd. also made funds available for a study of the use of nitrogen in pasture topdressing trials.

Pilot plots and simple demonstrations which made up most of the 140 dairy pasture trials mentioned in last year's report have yielded valuable information for the State. Examples are the work with green panic-lucerne pasture mixtures on the northern Darling Downs, and superphosphate demonstrations on coastal pastures.

It is intended that this form of work be now reduced to permit more exact experimental studies to be carried out. This new phase has already been commenced.

Staff increases have made it possible to commence pasture studies in new districts. A pasture improvement officer is now stationed at Emerald to work in the Central Highlands and the Central-west. One agrostologist has been appointed to the Darling Downs to study specific pasture problems associated with heavy black soils, while another is being posted to the Cloncurry district in the North-west.

A genetic study of Queensland blue grass has also been started. Queensland blue grass is one of the State's most valuable native grasses and it is known that a large number of variants of this species occur. One of the objects of this work is to test out various strains and to propagate the best for commercial use.

The third pasture improvement competition sponsored by the Royal National Agricultural and Industrial Association with the assistance of Departmental officers attracted 102 entries, compared with 85 for the previous competition.

Pasture Species.

No new species have been released for commercial use during the year, but there has been a spectacular increase in the use of a strain of prairie grass known locally as Priebe's perennial prairie. Many thousands of acres have been sown to this grass since 1955, and the dry conditions of 1957 will give the grass a thorough testing before larger areas are established.

The grass with the widest applications in the more densely settled portions of the State is still Rhodes grass, which, as with green panic and buffel grass, will combine with lucerne to give a long-lived pasture mixture.

Four commercial varieties of buffel grass are now on the market. These are the Gayndah, Biloela, Western Australian and Cloncurry varieties. A seed certification scheme for Gayndah and Biloela buffel varieties has been prepared.

The availability of a sprig planter for establishing non-seeding grasses by vegetative means is increasing the use of African star grass and kikuyu on waterways in soil conservation projects.

Winter pastures are receiving a thorough testing this year under drought conditions on the granite and trap-rock soils of the Warwick-Texas district. If the existing pastures of phalaris, cocksfoot, ryegrasses and clovers survive the dry winter of 1957 their economic usefulness in the area will have been firmly established.

The outstanding feature of the year as far as pasture legumes are concerned is the success being obtained with tropical legumes on poor soils in the subtropical coastal districts of the State. Centro and Townsville lucerne are being used in commercial stands in the Gympie district, while *Desmodium uncinatum* is also showing promise. Centro, Townsville lucerne and stylo have also been successfully established on hilly country round Currumbin on the south-eastern border. It is considered that the use of these legumes which do not require conditions of high fertility offers a cheap method of improving productivity in areas where costs must be kept to a minimum. The effect of Townsville lucerne on the yield of associated grasses growing on acid soils with low phosphate in the Gympie district is shown in Table 1.

TABLE 1.

EFFECT OF TOWNSVILLE LUCERNE ON ASSOCIATED GRASSES, GYMPIE, 1956–57 SEASON.

Grass Yield in Tons per Acre (Air-dry Weight).

Grass.	With Townsville Lucerne.	Without Townsville Lucerne.
Green panic	2·83	0·80
Rhodes grass	2·28	1·37
Buffel grass	1·41	0·10

This table shows that nitrogen supplied to the soil by the legume increased grass growth.

Pasture Seed Production.

It has been impossible for seed merchants to meet the demand for various pasture seeds in the year under review. The main shortage has been in the three local varieties of buffel grass. Table 2 shows the grass seed harvested in Queensland during the 1955-56 season. It is considered that the immediate requirements for buffel grass seed are in the vicinity of 180,000 lb.

Grass seed production must be increased both by farmers (for distribution through the normal seed trade) and by graziers (for the production of cheap seed for planting large areas on land of low carrying capacity). This work has been stimulated by the development of simple harvesting devices, most of which have no moving parts. Two simple harvesters are now available on the market at low prices.

Townsville lucerne is the only tropical legume harvested for seed in Queensland on a commercial basis, but centro and stylo seeds can be imported in sufficient quantity to meet requirements.

TABLE 2.

GRASS SEEDS HARVESTED IN 1955–56 SEASON.

	Lb.
Rhodes	75,720
Green panic	50,954
Buffel	21,120
Perennial prairie	76,648
Paspalum	7,500
Molasses	8,083

Source: Government Statistician.

Fertilizer Trials.

Pasture fertilizer studies with sulphate of ammonia, superphosphate and copper sulphate have been continued during the year, while a further series of complete fertilizer and trace element trials has been commenced.

The highlight of the pasture fertilizer work in the past year was provided by the nitrogen fertilizer trials being carried out on paspalum pastures at Coomera and Cooran and on blue couch pastures at Moggill. The object of the trials is to test the efficiency of sulphate of ammonia as a source of nitrogen for pastures in the absence of clovers, which are normally lacking in the State's grasslands. The greatest increases in yield were obtained from the summer treatment, the best gain being 9.04 tons of green matter per acre from the Cooran plot. Unfortunately, these gains coincide with the period when vigorous pasture growth is the rule under natural conditions. The question yet to be answered is whether lower increases in yield obtained by autumn top-dressing at a time when quality feed is scarce will be of more value to the farmer than the greatly enhanced summer yields.

The current legume fertilizer trials on the coastal country continue to stress the overall importance of phosphate in pasture development. Because of rapid phosphate fixation on many of these coastal yellow clay soils, applications of superphosphate as high as 10 cwt. per acre are not economic. More efficient results are obtained with 3–4 cwt. of superphosphate per acre at planting and 2 cwt. per acre for annual maintenance.

It is also known that low phosphate levels may prevent economical establishment of buffel grass. Tests have therefore been commenced to determine the lowest level of soil phosphate at which buffel grass will thrive.

Work on copper uptake by pasture species has been continued. It has been shown that on copper deficient soils in south-eastern Queensland, two 14 lb. per acre dressings of copper sulphate are required each year on narrow-leaf carpet grass pasture for satisfactory copper intake by the grazing animal.

Pasture Establishment.

A significant increase in the area of sown pastures can be expected in regions where as yet little is known about economically practicable methods of establishment. Problems connected with pasture establishment in pastoral areas are being investigated in the north-west, central-west and south-west areas of the State, with special reference to rate of spread of buffel grass from "island" strips.

In gidyea and brigalow areas large-scale clearing and burning have brought aerial sowing into the picture. This practice is well proven for sowing into the fresh ashes of scrub burns. Approximately 70,000 acres were sown from the air during 1956-57, the major species sown being Rhodes, buffel and green panic grasses.

"Brian Pastures" Research Station.

Experimental procedures in the study of cattle pastures were intensified at the "Brian Pastures" Research Station near Gayndah. Ten trials are in progress and six more are in process of establishment. The dry conditions have provided information on pasture behaviour under stress, but have delayed the commencement of several trials.

The productivity of rotationally grazed pasture mixtures, composed of lucerne and phasey bean with either Rhodes grass, green panic or buffel grass, has been very good. Over a period of two years, upward trends in total dry matter and in lucerne content occurred. Although the amount of grass component was highest in the Rhodes grass treatment, the average crude protein per acre was greater in the buffel grass plots. While lucerne maintained itself in the Rhodes grass treatment, this occurred at a level only 40 per cent. of that in the other two treatments. The combination of grass, lucerne and phasey bean tended to reduce seasonal fluctuations in protein level.

Estimates of the seasonal distribution of growth in relation to consumption and deterioration have suggested that even in these improved pastures, stock depastured at a beast to four acres were obliged for approximately six months of the year to obtain a portion of their requirements from residual growth produced during the summer growing season. The dry matter present had always been in excess of the theoretical appetite requirements of the animals, and in view of the under-utilization of these pastures, surplus summer growth was conserved as hay. Feeding back of this hay to the trial animals was commenced in the early winter.

Stock gains have been consistent throughout the past two years. As a reflection of the interest in younger beef, weaner steers at a beast to 2½ acres were brought on the trial in September, 1956; these made immediate weight gains. Animal productivity from the inception of the trial until the autumn of 1957 is summarised in Table 3. Weight gains are contrasted with those on native pasture stocked at half the intensity of the experimental blocks.

TABLE 3.

ANIMAL PRODUCTIVITY FROM SOWN PASTURES, BRIAN PASTURES RESEARCH STATION, 1955–57.

Group and Grazing Period.	Liveweight Gains in Lb. per Acre.			
	Rhodes.	Buffel.	Green Panic.	Native Pastures.
Group A. 7–1–55—20–1–56 ..	111·95	122·85	116·23	36·85
Group B. 20–1–56—11–5–56	40·32	43·40	34·44	12·74
Group C. 11–5–56—14–9–56	20·81	34·33	33·39	—8·82
Group D. 14–9–56—15–3–57	88·10	105·60	96·00	27·75
Totals of liveweight gains per acre from 7–1–55 to 15–3–57	261·18	306·18	280·06	68·52

This table shows the liveweight gains in lb. per acre for three experimental pastures in comparison with that from adjoining native pastures.

Extensive methods of pasture establishment were not very satisfactory in 1956. Lucerne mortality was high in the treatments which had received minimum cultivation, but sown grass seedlings survived well under drought. Substantial increases in densities of native legumes and black spear grass occurred, irrespective of cultivation treatment, following January firing and protection from stock.

The growth of phasey bean on a self-mulching soil of basaltic origin was significantly increased in 1956 from 41.3 to 48.7 cwt. dry matter per acre by the application of 8 oz. molybdenum trioxide per acre.

A trial studying the value of hay cuts taken from January to May and their effect on the growth rhythm and persistence of seven grasses was commenced. In 1957 the late cuts showed little deterioration in yield but substantial decline in protein, and little aftermath.

Development of a grazing trial on the management of native pastures has proceeded. The treatments involve various combinations of burning, different methods of stocking, chisel ploughing, fodder conservation and the provision of a supplementary lucerne area.

Irrigated Pasture.

The unusually dry summer and autumn period has intensified interest in irrigation for pastures and lucerne, though drought-inspired interest was developed too late to counteract the effects of the season. A substantial increase in area planted to irrigated pastures is evident in all districts of southern Queensland where irrigation can be utilized.

The biggest increases have been in the South Burnett, where it is estimated that a total of 400 acres of new irrigated pastures was sown to June 30, and in the Callide Valley, where 150 acres have been prepared for planting. Increased acreages also occur in the Brisbane Valley and Fassifern districts. The recent development of underground water for irrigation by the Bureau of Investigation and the Irrigation Commission has stimulated interest in irrigated pastures.

A big potential acreage of irrigated pastures awaits development in the Warwick-Killarney districts for dairying or fat lamb production. Here underground water supplies appear to be adequate on the alluvials adjacent to several small watercourses. Interest in irrigation of pastures is also being shown at Maleny, in the 70 in. rainfall coastal belt. Here, a number of irrigation projects depending chiefly on storage dams are in operation.

Plate 4.—A Hillside Pasture Designed for Contour Furrow Irrigation.

The usual practice of withholding irrigation in summer in the expectancy of seasonal rains was again evident, and in the present year resulted in serious damage to many pastures. The importance of timely irrigation for the maintenance of continuous high pasture production is not yet fully appreciated.

One factor which has a direct bearing on irrigation use is efficient design and layout of irrigation plants for both border and spray irrigation. This applies equally to the suitability of the power unit, the size of the delivery pipe, and the layout of the irrigated field. This has been demonstrated quite clearly during the current dry spell, when irrigation is almost continuous and pumping costs have been unduly high where inefficient plants are in operation.

During the year two automatic land levellers for use with medium-powered tractors and two smaller orchard-type levellers have been purchased by the Department from Commonwealth Extension Services Grant funds, and are now in use. These implements can be operated by the tractor driver and therefore reduce the cost of land preparation for irrigation. Their use has resulted in an appreciable improvement in the efficiency of land preparation for irrigated pastures.

Plate 5.—A Hillside Irrigated Pasture Head Ditch. Note the lower furrows to spread water released from it.

A number of earth dams for water storage for irrigation have been constructed during the year. Recently built dams have not yet been filled and the dry season has emphasised that runoff and adequate capacity must be considered in design and construction of water storage facilities.

FODDER CONSERVATION.

The production figures for ensilage show an appreciable annual increase over the last four years for which figures are available. Annual production, as shown by the Government Statistician, is as follows:— 1952, 12,808 tons; 1953, 18,513 tons; 1954, 24,760 tons; and 1955, 36,191 tons. Though these figures show a trebling of the quantity of material ensiled annually as between 1952 and 1956, the amount conserved today is of no real significance in relation to the State's livestock population. A considerable amount of the silage stored in Queensland is on sheep properties. However, even if all the 1955 production of silage were available for dairy stock it would only provide about two day's feeding per dairy cow.

The increase shown reflects an increase in the average tonnage per property rather than in the number of property owners practising this form of conservation. During the 4-year period the number of properties on

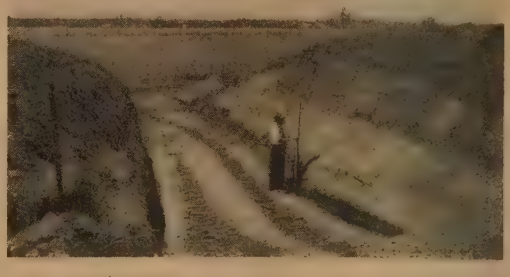


Plate 6.—A Silage Trench With Adequate Wall Slope to Ensure Tight Packing of Silage Against the Sides.

which silage was made increased by only one-sixth, from 248 to 289. When it is considered that there are probably 40,000 properties in the State which carry some livestock, the percentage of those which

engage in this valuable form of conservation is pathetically small. Of the 19,000 dairy properties with 20 or more milking stock, a very high proportion could benefit greatly by ensiling fodder. The availability of reasonably priced fodder harvesting machines brings this ideal closer to the possibility of realisation than ever before.

Plate 7.—Harvesting Sweet Sorghum for Silage at Rocklea Animal Husbandry Research Farm.

Production of hay has also shown a gradual increase in recent years, though there was a fall of nearly 5 per cent. in the tonnage in store at Mar. 31 as between 1955 and 1956. The most recent figures (for Mar. 1956) show that 149,187 tons of hay were stored by 4,461 property owners.

While good seasons afford the opportunities for conservation, unfortunately they do not provide the incentive. Thus the run of good seasons prior to 1957 did little to assist extension in its drive for greatly

Plate 8.—Storage of Grain on the Farm Provides Stock Feed in Dry Years and Assists in Marketing Surplus Grain.

increased conservation of fodder. During this period there has been a growing interest in practices such as water conservation, pasture establishment, irrigation, subdivision and weed control—all calculated to stabilise animal production. However, experience in 1957 has highlighted the fact that these alone are insufficient to meet the demands of a period of widespread inadequate rainfall.

SOIL CONSERVATION.

Good progress has been made in the application of soil conservation measures to agricultural lands during the year under review. The conditions of below-average rainfall have assisted, particularly in relation to the building of protective earthworks. In the South Burnett district, record work totals were achieved in the spring months, and the Darling Downs annual total was the highest on record.

Progress in the application of agronomic measures has not been as satisfactory, though the increased interest of farmers in soil protection through stubble retention and modified systems of cultivation is gratifying.

Soil Erosion.

The dry conditions prevailing in most districts have assisted in reducing total soil losses for the year. However, very serious losses were recorded at Atherton in January to March due to excessive rains.

Minor to moderate soil losses were recorded in most of the agricultural districts during the mid-December rains. This unusual rain group included falls up to 21 in. in three days at Childers, and totals of 5–7 in. in the Darling Downs, South Burnett and Central Highlands districts. At Childers the soil losses were serious on practically all fallowed land, and on some properties reached an estimated 100 tons per acre.

Conservation Farming.

The farming community is now well aware of the need for careful and planned land use. However, most landholders adopt only those conservation farming practices which they consider to be immediately practical. For example, it was recorded for 1955-56 that there had been a marked increase in stubble burning on the Darling Downs; in 1956-57 a high percentage of cereal stubble was retained for soil protection. This change can probably be attributed to the fact that in 1955-56 management aspects (problems of handling a dense and weedy stubble) were of greater significance than the soil protection aspects, since 1955 was not a bad erosion year. In 1956-57 the management problems appeared of lesser importance than soil protection, for the devastation of the early 1956 rains was still a vivid memory.

Tined implements continue to increase in popularity, particularly in the black soil areas. This trend is associated with the capacity of this equipment to handle crop residues and to permit moderately deep working at a reasonable cost. Such implements are useful accessories in a soil conservation programme but their value is at times overrated.

There has been a continuing interest by farmers in the use of improved pastures to provide a rest and regeneration period for cultivated lands. During the year a number of Atherton farmers have planted some pastures on their farms and are changing from a maize monoculture enterprise to one in which dairy cattle and pigs also play a part. Some interest of Darling Downs farmers in conservation farming is indicated by the fact that seed merchants in that area report that sales of pasture seeds reached a record level this year. In the South Burnett and other districts a similar trend is evident.

This trend has, however, received a setback due to drought conditions during the normal autumn establishment period in 1957. The use of ley pasture in crop rotation programmes is of course still very much in its infancy in Queensland. While its conservation advantages are widely acknowledged, the crop farmer will not willingly increase his management problems by introducing stock unless he can see important economic advantages.

Further action was taken during the year to demonstrate the value of kikuyu grass and African star grass for waterway and gully stabilisation purposes on the Darling Downs. The planting procedure with these vegetatively propagated grasses was mechanised by using a locally made Bermuda grass sprig planter. The total area planted mechanically, including waterways and pilot pasture plots, was approximately 100 acres. The results are very encouraging despite the dry season, and this work could have far-reaching effects in helping to solve the major problem of gully stabilisation in these and other black soil areas. The early observations with African star grass suggest that it may have some potential for pasture purposes on those sections of the Darling Downs plains which are subject to periodic runoff flows.

Runoff and Erosion Control Structures.

The control of runoff poses some problem to almost all of the farmers engaged in agricultural activities in this State. Even the near-level lands of the Darling Downs plains country do not escape the effects of this problem. The progressive adoption of conservation farming practices is helping to reduce the damage from excessive runoff, but the major task of intercepting and disposing of this runoff still remains. Erosion control

and runoff control are complementary requirements on cultivated land. The orthodox soil conservation structures have now proved their worth on the undulating agricultural lands and these measures are selling themselves to an increasing degree.

Soil conservation officers have applied protective works to 13,000 acres of agricultural land during the year. This is approximately the same figure as for last year, but increases were recorded for both the Darling Downs and Burnett regions. The area treated on the Darling Downs totalled 6,500 acres and in the Burnett district 5,300 acres, in both cases an increase of about 900 acres on the figures for the previous season. While the progress is very satisfactory in terms of available staff, there is no room for complacency since the year's total represents only a small fraction of the known problem area.

Soil conservation work again attracted the attention of various earthmoving contractors in both the Darling Downs and Burnett regions. The number so engaged totalled up to 12. This year staff limitations on the Darling Downs made it difficult to plan sufficient work to meet the needs of all available contractors. As a result, many have engaged in work planned by farmers, some of which has resulted in friction with neighbours and with local authorities. The seasonal work pattern in the South Burnett has had a disturbing influence upon overall progress. Here, in the spring months, Departmental officers and contractors cannot cope with the demand, while in late summer and autumn, when most of the land is under crop, the demand for such services is very low.

Extension Activities.

Soil conservation work is not unlike veterinary practice in that a detailed inspection is required in order to assess the factors responsible for the problem and to determine and apply the necessary preventive or remedial action. The farm visit therefore still remains the key to successful extension effort in this field. Mass media are used to the maximum extent to stimulate interest in the subject, and to outline the broad principles of approach.

During the year under review 20 field days and conducted tours were arranged. Officers attended 40 meetings of primary producers' organisations, and delivered lectures on soil conservation and allied subjects. Other mass media of instruction included 24 press articles, 14 radio talks, 10 show exhibits and 2 special instruction schools. In all, approximately 2,000 farm visits were made in connection with the preparation of farm plans and the survey of runoff interception structures.

Planning.

Good progress has been made in the standardisation of mapping procedures in accordance with the grid reference system referred to in last year's report. Twenty-five additional maps, each representing about 5,000 acres, have been completed for the South Burnett district, bringing the total for that area to 120 detail maps covering an area of 600,000 acres. The aim now is to complete the conservation planning on these maps in advance of the needs, so that a blueprint of all future works can be available not only to farmers but to other Government Departments and local authorities. As individual farm or catchment plans are required to meet a specific request a copy can be readily taken from the grid reference maps.

Group Schemes.

Progress can be reported in the Bones Knob-Mapee and the Halloran's Hill Schemes at Atherton. Construction work commenced on the Bones Knob Scheme in September last, and in the ensuing three months 30 miles of waterways were constructed on a contract basis under the direction of the Atherton Shire Council and the supervision of the local soil conservation officer. Work has also started on the Halloran's Hill Scheme.

Farmers interested in the Booie Road Scheme in the South Burnett district have decided not to proceed with the scheme as an official project and will now implement work on a unit farm basis but in accordance with the group plan. Very satisfactory progress has been made in implementing works in the Wooroolin and Memerambi Group Schemes. In each of these schemes half of the waterways have now been constructed. In addition, the areas contour-banked during the year are 400 acres for the Wooroolin Scheme and 500 acres for the Memerambi Scheme. While these works are being done in accordance with the catchment plans, the schemes are being implemented on a unit farm basis, each farmer arranging and paying for the work on his property.

Investigations and Research.

Three land preparation trials were conducted on the Darling Downs during the year, but due to effects of flooding earlier in the year the Dalby trial was not harvested. The results confirm last year's observations at Allora. It is now clear that for most Darling Downs soils the method of land preparation is unimportant provided it is sufficiently thorough to control weeds and permit adequate aeration and moisture penetration. Farmers in these areas can now be assured that the application of soil conservation practices of deep working, coarse fallowing and stubble retention will not adversely affect their crop yields.

Gully and waterway stabilisation investigations were continued in the Darling Downs and Atherton districts. The general conclusions are that both kikuyu and African star grasses are suitable for colonising waterways or gullied areas. The former provides the better protective cover but colonises at a slower rate than the latter. African star grass appears to have possibilities for ley pasture on black soil areas, but in view of uncertainty concerning ease of eradication, trials were initiated to clarify this issue. Results so far are inconclusive; percentage kills from chemical treatment ranged from 5 to 90 per cent. according to the spray concentration used, and control by ploughing was 90 per cent. under conditions favouring re-establishment of the grass.

Runoff measurements were made at the Kairi Regional Experiment Station on several occasions during the summer months. Runoff was highest from the maize borders, with little differences between the maize ploughed and maize stubble-mulched. Runoff from the pasture areas was much lower, the lowest figures being recorded from the lucerne-grass and lucerne borders. An interesting observation was that the total runoff from the maize border in December-January was only 2.7 in. out of a rainfall of 22 in. for the period.

AGRICULTURAL MACHINERY.

Supplies of all agricultural machinery have been good throughout the year, and the demand has been satisfactory. Chisel ploughs have maintained their popularity, and there is a general trend towards the greater use of tined implements for both primary and secondary tillage purposes.

The initial demonstrations of vegetative planting of kikuyu grass in farm waterways on the Darling Downs with the Bermuda sprig planter were successful. A planter of generally similar specifications has been manufactured locally and has enabled more demonstration plantings to be carried out. Alterations to the specifications have been made to suit local soil conditions.

In the tobacco industry, trials have been carried out with a Case 88 self-propelled tobacco harvester owned by the Commonwealth Department of Primary Industry. Initial trials show promise and further testing is proposed. The Bowen Auchincruive soil injector has again performed successfully in controlling nematodes in tobacco, and use of this machine for other crops affected by nematodes is being sought.

Further mechanisation has occurred in the peanut industry with the introduction of a mechanical stooker. In addition, investigations into artificial drying of peanuts are being conducted. A few farm-size driers are already in use on the Atherton Tableland.

Increasing use has been made of aircraft in agriculture. These have been used to dust and spray for pest and disease control, as well as to sow large areas of burnt scrub with grass seed. It is estimated that the figure of 115,756 acres treated during the 12 months ended June 30, 1956, was almost doubled in the past year.

The Branch has maintained a close liaison with manufacturers and distributors of farm machinery, and has provided an advisory service to primary producers on matters relating to machinery and farm equipment.

SOUTH JOHNSTONE EXPERIMENT STATION.

The annual rainfall of 140 in. was 20 in. above average, and October was the only month with less than 3 in. of rain. October-November and February were the only months in which weather conditions retarded pasture growth.

Pastures.

Establishment of experimental pastures of para grass, guinea grass and centro has been completed. The necessity to control such weeds as giant guinea grass, couch grass and giant sensitive plant (*Mimosa invisa*) has made establishment somewhat difficult. This pasture is in ten 2-acre fields which will be used to study pasture management practices. Grazing should commence in the late winter of 1957.

Results from the continuous grazing trial at Utchee Creek have confirmed earlier observations. The guinea grass-centro pasture was the most productive, with an average annual carrying capacity of 1 steer to 1.21 acres, compared with guinea grass alone at 1 steer to 2.24 acres. Para grass and centro carried 1 steer to 1.81 acres, compared with para grass alone at 1 steer to 2.23 acres. Molasses grass and centro carried 1 steer to 2.17 acres and molasses grass alone 1 steer to 2.92 acres. The value of centro as a pasture component under these conditions is now so well authenticated that the continuous grazing trial will be modified to provide further information on the comparative value of puero in this role.

Another area of guinea grass-centro pasture has been established at Utchee Creek. In this trial 16 acres under continuous grazing will be compared with four 4-acre fields under rotational grazing. The progressive carrying capacity and the behaviour of the pasture will be examined.

A short-term trial of elephant grass pasture reported last year has encouraged the use of this species on farms. This vigorous tufted grass is not unmanageable under grazing, provided excessive stemmy growth is controlled by mowing.

A previously unreported strain of guinea grass, now referred to as Hamil grass, has given very promising results in the field. This strain is more robust than common guinea and the stem is less hairy and more succulent. Hamil grass will be closely examined next year for nutritive value, palatability and productivity.

Tea.

The season was generally favourable for tea but there were periods of stress in midwinter and in late February. Many young plants died during the latter period.

Attention was concentrated on the consolidation of old and new tea seed gardens and on the hedge plantings. The older hedges were systematically plucked, and dried tea was prepared several times during the year. The quality was satisfactory and the year's yield was at the rate of 3,400 lb. of tea per acre—almost three times the yield previously obtained from the old tea garden. The hedges, planted over a 3-year period, will soon be ready for testing the available harvesting machinery. The distribution of tea seed and seedlings for planting in private gardens has been continued and a technique for vegetative propagation is being examined under local conditions.

The position now is as follows:—The area has proved suitable for the production of tea of acceptable quality. Provision has been made for obtaining considerable quantities of planting material locally, should the need occur. Facilities are available for testing any mechanical harvester such as may be devised for use under local labour conditions.

Seed Production.

Guinea grasses are amongst the most useful pasture species for the wet tropics. Unfortunately, some of the attractive strains do not set much viable seed, purple-top guinea being the worst in this respect. The problem is under examination but so far no improvement has followed the use of various soil additives.

The production of puero seed is still being investigated. The control of insect pests and the mechanisation of seed harvesting present the most difficult problems.

Small quantities of seed rice of three varieties suitable for Queensland are maintained but no expansion of this work is contemplated.

Weed Control.

The wild tobacco bush is still a serious weed in new pastures on rain forest land but effective control measures are in fairly general use. Of recent years, however, two other weeds are spreading on the tropical coastlands with alarming rapidity. These are the giant sensitive plant and knobweed (*Hyptis capitata*). Observations indicate that both are susceptible to hormone weedicides but repeated applications are necessary because both species set enormous quantities of viable seed.

Miscellaneous.

The named specimen plots of tropical plants have been maintained and added to during the year. These plots are of considerable educational interest to visitors, but also maintain a stock of planting material which can be supplied to farmers. Sweet potatoes and the pasture legumes are more in demand than the other plants.

TOBACCO EXPERIMENT STATIONS.

Parada.

Developmental work is being continued on the Parada Tobacco Experiment Station, although progress is not rapid. No further buildings have been erected but contracts are let for the construction of a Manager's residence, two staff cottages, single men's quarters, a curing barn and bulk shed unit, and a fuel store. A permanent domestic water supply is installed, a temporary irrigation supply is in use from the Walsh River, electric power is installed and preparations are well in hand for connecting the telephone. Two additional areas approximating 15 acres were cleared and these are now securely fenced.

The Parada Station provided facilities for two plant pathology trials described elsewhere. A range of tobacco varieties was planted for observation and seed production. Kelly was the first to reach maturity and Mammoth Delcrest, an attractive selection, was the last to ripen.

There was no appreciable advantage in using the organic materials peatmoss, vermiculite and perlite in seedbeds as compared with the standard practices of burning and sand-mulching, although the seedlings grown in peatmoss were ready for the field a week earlier.

The imported Case 88 tobacco harvester was tested in the field with promising results. The machine has been modified slightly and will be tested further next season.

Inglewood.

The flood damage has now largely been repaired on Inglewood Tobacco Experiment Station and the rotational trial was re-established on the Rhodes grass fallow where surface soil had not been removed by the flood waters. Small patches of nutgrass continue to appear where nuts have been introduced in silt deposits. These are treated with hormones or methyl bromide as the occasion demands.

A good stand of 3,000 Hicks plants was harvested for seed and a fair yield obtained despite the ravages of parrots.

Work has commenced on the erection of a Manager's residence. The same builder also holds the contract for a set of three barns and paving of the main building area on the Station.

REGIONAL EXPERIMENT STATIONS BRANCH.

Mr. W. J. Cartmill, Director of Regional Experiment Stations.

The programmes of the six Regional Experiment Stations in Queensland are designed to study problems relating to agricultural and horticultural crops, pastures and pasture management, and the livestock industries.

In addition to operating Stations at Hermitage near Warwick, Biloela in the Callide Valley, Ayr and Millaroo in the Burdekin district and Kairi on the Atherton Tableland, the Branch now administers the Irrigation Research Station at Gatton formerly controlled by the Bureau of Investigation of Land and Water Resources. This will be known as the Gatton Regional Experiment Station. The Station has pioneered research into irrigated temperate pastures in Queensland, and although these studies will be continued, greater attention will be directed to the study of problems of irrigated crop production in the surrounding Lockyer Valley.

The main results of experiments are briefly reviewed for each Station; further details are supplied in reports of co-operating Branches. The rainfall at the various stations is shown on page 52.

HERMITAGE.

Activities continued to expand at the Station, and facilities for handling stock in the various experiments associated with sheep and pigs were improved.

Excessive rain in the late autumn and early winter of 1956 caused periodic waterlogging of the soil and leaching of soluble plant foods, and early growth of winter cereal crops was poor. Frosts in July and August caused some tip damage, but more severe damage to emerging heads followed late September frosts. Conditions for the growth of summer crops were generally favourable.

Crops.

Wheat.—Although the yields of grain in the standard wheat variety trial and other wheat experiments on fertile alluvial soils were lower than in the previous year, due undoubtedly to the incidence of late frosts, they were nevertheless satisfactory. The earlier maturing varieties were affected to the greatest extent by the frosts, as manifested by the comparatively low yield of Seafoam (24.0 bus. per acre), Puora (27.0) and Spica (31.5). Two other early-maturing varieties escaped to some extent the more severe effects of the frosts and yielded better. Of the mid-season wheats, K,S4604 (an unnamed strain) produced 42.6, Celebration 42.3, Charter 38.0 and Lawrence 35.2 bus. per acre.

Grain Sorghum.—Because of good planting rains in early December and subsequent good growing conditions until the end of January, all varieties of grain sorghum made satisfactory growth. Although the later part of the season was dry, stored soil moisture was sufficient to fill out the grain and yields were Early Kalo 92, Kalo 88, Martin 85, Caprock 81, Alpha 80, and Wheatland 76 bus. per acre.

Oats.—Further quantities of seed of the variety Bovah—a Hermitage-bred oat—were grown and distributed to seed growers. A few bags of the introduced variety Benton, which has shown promise in trials, were also distributed. The plant breeding programme relative to this crop was expanded during the year.

Other Crops.—Linseed crops were little affected by frosts and gave satisfactory yields of approximately 20.0 bus. per acre. Safflower crops, on the other hand, were severely affected, and no useful yield data were obtained from them. Barley grown for pig feed yielded well at 40.0 bus. per acre. Lucerne performed well as a component of sown pastures.

Pastures.

Rhodes grass-lucerne pastures again proved very productive on the lower hillside slopes and provided good grazing for the sheep. Green panic has been somewhat disappointing in respect of vigour.

Of the winter growing species, prairie grass performed well and in combination with lucerne was a useful winter pasture. Phalaris-lucerne mixtures also provided good succulent grazing. H1 ryegrass and Wimmera ryegrass were superior to perennial ryegrass.

Observations were made in the nursery of a range of pasture grasses and legumes covering 107 species and strains. Species in the genus *Phalaris* were again superior as a group among the grasses. Of the prairie grasses, *Bromus catharticus, B. carinatus* and *B. unioloides* made good growth in the winter, while *B. inermis* grew best during spring. Hunter River lucerne is still much superior to the imported strains of this legume.

Rotations.

In a 4-year cash crop rotation (wheat, wheat, long fallow with and without cowpeas as a green manure, followed by grain sorghum), commenced in 1955 and located on fertile heavy alluvials, the wheat yield averaged 42.1 bus. per acre.

Sorghum following cowpeas (71.5 bus. per acre) yielded substantially better than sorghum after fallow (58.8 bus. per acre.).

An 8-year cash crop and grazing rotation (four years lucerne followed by grain sorghum, wheat, oats for grazing or grain, and wheat) has been established on two sites, one on deep fertile alluvial soil and the other on shallower fertile soil on gentle slopes. In the former, wheat yields averaged 30.1 bus. per acre, with little difference between plots following a fallow after sorghum and after oats respectively. In the latter the yields following fallow after sorghum (26.0 bus) were better than following fallow after oats (16.6 bus.), the former benefiting by a longer fallow.

In both rotations the sorghum yields were better after fallow following wheat (61.3 and 38.1 bus. on the deep and shallow soils respectively) than after lucerne (36.8 and 34.0 bus. respectively), due probably to better reserves of soil moisture and to more available nutrient reserves accumulated during the longer period of fallow.

BILOELA.

The programme of investigations covers a very wide range of summer and winter crops, while testing of pasture species and pasture management methods, and grass seed production are important facets of the programme. Irrigation facilities are now well developed, and in addition to studying supplementary watering of crops, observations are being made on a fairly extensive area of land devoted to irrigated pastures. One herd of dairy cows is maintained on these pastures, and a second herd is grazed on dryland pastures and fed silage during the period of the year when grass production is low.

The activities of the piggery section have been enlarged during the year.

Initial trials of fattening male calves from A.I.S. cows, for slaughter as yearlings, have been completed with very promising results.

Crops.

Wheat.—The mean yield of 12 varieties in the standard wheat variety trial was 40.5 bus. per acre, a record for the Station. The five leading varieties—Charter, Pusa 4, Puno, Gabo, and Saga—exceeded 44 bus. per acre. Spica produced 40.4 bus. The only

useful rain during the growth of this crop occurred in July, when falls of 1.98 in. and 0.68 in. were registered. The balance of the total water utilized (approximately 9 in.) was obtained from conserved moisture in the soil.

In an early-planted rate-of-seeding trial, it was shown that 30 lb. of seed per acre was too low and rates above 50 lb. were unwarranted. A 40 lb. rate seems adequate. The mean yield of the experiment was 41.2 bus. per acre.

In a late rate-of-seeding trial which produced an average yield of 24.9 bus. per acre, it was shown that sowing of 60 lb. is advisable for late plantings.

Safflower.—Testing of varieties was continued. The variety now named Horowitz has been outstanding in oil content and quality, and pure seed was produced for future distribution on the Darling Downs.

Cotton (Rain-grown).—The dryland crops were sown in early November. They experienced wet conditions in December and severe weed competition in January. The rest of the season was dry, wilting and shedding were severe, and little cotton developed for a second pick. Under these adverse conditions quite fair yields were obtained.

The cotton varietal trial produced an average yield of 500 lb. of seed cotton per acre, Miller 610, Miller 41 S and Empire being the leading varieties.

Data from the "small farm" cotton rotation clearly indicated the advantages of planned farming methods. The rotation is four years Rhodes grass followed by cotton, then grain sorghum, then cotton and return to grass phase. Control plots which have been under cotton continuously for over 20 years yielded only 42 and 40 lb. of seed cotton per acre, whereas cotton in the first year after grass produced 445 lb. and cotton following sorghum in the third year after the grass phase yielded 472 lb.

Results from the "large farm" cotton rotation resulted in similar failure of areas cropped to cotton continuously. The main rotation includes four years of grass followed by four years of cropping—namely, cotton for two years, followed by sorghum, and then cowpeas and a cereal in the final year before returning to the grass phase. The yield from cotton in the first year after grass was 723 lb. per acre.

A preliminary study of chemical control of weeds in cotton indicated that chloro IPC and C.D.E.C. (Vegadex) applied as pre-emergence sprays considerably reduced the occurrence of weeds, particularly black pigweed (*Trianthema* spp.). Good weed control was still obvious through January following November application.

Cotton defoliation studies were continued and promising results were obtained with sodium monochloracetate in combination with amino-triazole and with the latter chemical alone.

Cotton (Irrigated).—The dry season necessitated regular irrigations from January to March and this control of moisture supply allowed production of high yields from most experiments. In the fifth year of a nitrogen side dressing fertilizer trial, treatments on a per acre basis were (i) 2 cwt. sulphate of ammonia applied in early December, (ii) 2 cwt. sulphate of ammonia in early December and again in January, and (iii) 2 cwt. sulphate of ammonia in January only. Yields of seed cotton were respectively 1,789, 2,570 and 1,613 lb. per acre, against 1,364 lb. from unfertilized cotton. The net gain due to fertilizer in treatment (ii) after allowing for various extra costs was £29 11s. per acre.

In the fifth year of a comparative study of irrigated versus dryland cotton production without added nitrogen, 19 in. of water was applied to the irrigated block for a yield of 1,261 lb. seed cotton per acre, whereas the dryland crop yielded 362 lb.

The top-yielding variety in the irrigated cotton varietal trial was D & PL14 with 1,922 lb. seed cotton per acre, followed by Acala 5675-10-2, 1,600 lb.; Empire, 1,587 lb.; and improved New Mexico Acala 120 BS., 1,479 lb.

Grain Sorghum.—Grain production was reduced by the severe climatic conditions from January on, but all varieties in the varietal trial produced more than 23.6 bus. per acre, and Alpha, which is the top-yielding grain sorghum over an 8-year period, again led with 29.0 bus. per acre.

The demand by this crop for soil moisture during the summer is well illustrated in results from a row spacing trial in which the yield of 24.2 bus. per acre from areas sown in 42 in. row spacings significantly exceeded the yield from 28 in. and 14 in. spacings. In favourable rainfall years, higher yields are obtained from 28 in. spaced rows, but in dry seasons or when soil moisture content at planting is low, better results are obtained from crops sown in 42 in. rows.

Sweet Sorghum.—Silage crops of the Sugardrip variety produced 10 tons of fodder per acre and some 18 bus. of "mother seed" was grown for distribution by the Department to certified seed growers.

Pastures.

Buffel Grass.—Mother seed production of Biloela buffel grass was continued to ensure supply to growers of certified seed in the coming season. An area of Gayndah buffel grass is being established for the same purpose.

Species Grazing Trials.—Of the eight species in the third year of one trial, elephant grass exhibited good drought tolerance, and guinea grass, *Seteria sphacelata*, *Brachiaria brizantha* and *Panicum makarikariensis* maintained fair production under the dry conditions experienced. Rhodes grass and Queensland blue grass, though satisfactory in the early summer, became coarse and stemmy and generally unpalatable as conditions deteriorated. Production from *Urochloa mosambicensis* was poor.

Dairy Pastures.—Under drought conditions pasture production of non-irrigated pastures has been lower than usual but the advantages of row-cultivated pastures for maintaining grazing in dry seasons was clearly indicated by the significant increase in yield from row plantings.

Production of irrigated pastures has been maintained at a high level, and apart from supplying fodder for one herd of dairy cows, the 20-acre area has been fully utilized to study yields of mixed species and the water requirement, management and growth habits of separate species and simple and compound mixtures.

Livestock.

Dairy.—Two herds consisting of young A.I.S. animals are maintained, one on rain-grown pastures and crops with supplementary silage in dry periods, and one on irrigated pastures with rain-grown pasture for roughage. The former herd averaged 14 lb. of milk per cow per day and the irrigated pasture herd 21 lb. per cow per day since August, 1956, when the separate units were established.

Plate 1.—Self-feeding of Pit Silage to A.I.S. Weaners at Biloela. By using the rack frame there is little waste of fodder.

Yearling Beef Production.—Eight steers from A.I.S. cows were fattened to determine whether such progeny can be utilized in the beef trade. When 10 months old they were grazed on irrigated pastures and over a period of seven months they gained 1.8 lb. per head per day.

Plate 2.—One of Eight A.I.S. Steers Finished Off on Irrigated Pastures.

Piggery.—A number of trials related to feeding of pigs were completed during the year. The yard and pen facilities have been enlarged and suitable grazing areas have been established.

AYR.

This "dry tropic" region receives a mean annual rainfall of approximately 50 in., of which 75 per cent. is received during the summer wet season. Although the Burdekin Delta is an important sugar producing district, there is much land available that can be used for growing a wide range of agricultural and horticultural crops. Because of the mild winter temperatures, crops normally grown in summer can be grown "out-of-season" at Ayr with the aid of supplementary irrigation.

Crops.

Maize.—It has been shown that consistently high yields of maize can be obtained following planting immediately after the wet season, with best results from hybrid varieties such as Jubilee, Victory, Q692, Q724 and Q739. Applications of nitrogenous fertilizers have given economic gains. In most years some irrigation is necessary to supplement the water supply held in the soil from the summer rains.

The crops sown in the autumn of 1956 following a prolonged wet season required fertilizers to replace nutrients which had been leached from the soil. An unirrigated variety trial of eight hybrids and one open-pollinated variety yielded an average of 37.8 bus. per acre. The stand was poor and wet weather after the April planting prevented normal cultivation. Jubilee gave the highest yield.

In an irrigated trial sown in late May, Jubilee again gave the highest yield with 94.3 bus. per acre, followed by Q692 (90.1), Q739 (87.6) and Victory (79.9). In this experiment, sulphate of ammonia was applied at 2 cwt. per acre when the maize was 18 in. high, and again at the pre-tasselling stage. The fertilizer costs were £8 18s. and the gross return from the variety yielding 94 bushels per acre was £70 14s. when based on maize at 15s. per bus.

In a maize fertilizer trial of four treatments including heavy application of fertilizers, the highest yield of 92.8 bus. per acre was obtained from the treatment receiving the most nitrogen. However, more economic yields were obtained by use of less fertilizer.

Cotton.—Previous results suggest that cotton has an important place in the agricultural development of this region of Queensland. Unfortunately, the 1956 season was unfavourable for this crop and many plantings failed to set bolls or else produced very poor yields. The failure was largely attributable to the prolonged wet season and to above-normal winter rains during the early growing period which suppressed boll formation. Furthermore, active regrowth in spring resulted in strong vegetative branching but little boll formation. A review of past results indicates that boll setting must occur before temperatures decline in May if high yields are to be obtained; thus there is an obvious advantage from early planting.

In the irrigated variety trial, mean yields of seed cotton ranged from 466 to 531 lb. per acre, Acala 5675-10-2 giving the best result. The new variety Arkot produced 493 lb. per acre.

In cotton defoliation studies, testing of amino-triazole was continued and results indicated promising defoliation at the 1 lb. per acre rate when applied in 40 gallons of water. This chemical is also a valuable additive to other formulations as it will suppress regrowth and thus ensure clean bushes for a longer period should harvesting operations be delayed.

Testing of various growth regulating substances has shown that ANA at 20 p.p.m. or higher will increase flower formation and fruit setting.

Oats.—The Ayr Station has been utilized to test a wide range of oat varieties, with emphasis being placed on rust resistance. Satisfactory yields of over 4 tons of hay per acre off grazing oats were obtained following May plantings.

Safflower.—Further testing of six varieties of this oilseed crop illustrated that crop damage can result if pollination is upset by spray irrigation or rainfall. Losses also occurred just prior to harvesting, when rainfall caused germination of seed in the heads.

Cowpeas and Cover Crops.—Trials were conducted with various cultures provided by the Plant Pathology Section to test their effectiveness for inoculation for *Phaseolus mungo* (mung bean) and *Cyamopsis tetragonolobus* (guar bean). Slight improvement was recorded in inoculated plantings.

Seed stocks of the recently named cowpea introduction Q3004 (Malabar cowpea) were multiplied, and variety trials showed that mung bean, phasey bean and cowpea Q3005 were the most productive cover crop legumes during the season.

Beef Fattening Trials and Irrigated Pastures.

The para grass–centro legume combination has been the most productive pasture during the grazing periods over four years; it carried 1.7 animals per acre. The average liveweight gain was 1.85 lb. per acre per day.

The legume centro is now invading most other mixtures, and the ability of this species to spread and stimulate production of associated grasses is an outstanding feature. A recently established pasture of an introduced strain of elephant grass with centro is showing very favourably early development.

Horticulture.

Pineapples.—In a time-of-planting trial, 1½ acres of pineapples were established during December, January and February. This area will be gassed at appropriate times during 1957 in order to determine plant response to treatment at different stages of growth.

Bananas.—Damage resulting from the March 1956 cyclone was still obvious throughout the year. In the re-established stand, bunches were not thrown until February 1957 to form the crop now being harvested.

In the water utilization studies it was shown that frequent light waterings are preferable to heavy applications at intervals of approximately six weeks. Mulching between plants was effective in reducing watering requirements.

Exploratory work was commenced with selection and testing of a range of varieties of papaws, passion fruit and rockmelons.

MILLAROO.

The Millaroo Regional Experiment Station, situated in the Burdekin River Valley 40 miles from Ayr, has been allocated approximately 1,200 acres of land only one mile from the new township of Millaroo. This centre will allow study of problems in respect of agricultural and horticultural crops in this new settlement and

critical examination of the potentialities of all of the major soil groups which could eventually be watered from the Burdekin River irrigation project.

The settlement is primarily concerned with tobacco growing but production of alternative crops, such as cotton, maize, sorghum, pumpkins, potatoes, peanuts, beans, tomatoes, pineapples and seeds of grasses and legumes, is attempted.

Very few meteorological records are available, but the average rainfall is below 30 in. per annum, the mean maximum monthly temperature ranges from 77 deg. F. in July to 90 deg. F. in December, and the mean minimum monthly temperature ranges from 52 deg. F. in July to 72 deg. F. in January. Rainfall during 1956-57 was approximately 30 in., including an unseasonable fall of 4 in. in July 1956.

During the year very satisfactory progress has been made in the developmental programme. Cropping experiments have been expanded on the agricultural soils, and pastures have been established on the heavy soils of the flood plain.

Crops.

Cotton.—Conditions were unsuitable for cotton and due largely to the excessively wet season in 1956 the yield from most experiments was lower than anticipated.

In a variety trial D & PL 14 and Acala 5675 yielded respectively 370 and 368 lb. of seed cotton per acre. Pure seed of the latter variety was produced for future selection and multiplication.

In a cotton thinning trial with two varieties, yields of seed cotton per acre were:—Miller 43-9, thinned 874 lb., unthinned 563 lb.; D & PL14, thinned 1,147 lb., unthinned 1,117 lb. seed cotton per acre. In some plots thinning operations reduced weed competition. In this district, where thinning is not usually practised, an even stand of plants at a density of up to 12,000 per acre appears to be necessary for high yields.

Maize.—In comparing the influence of time of planting on the yield of four varieties each planted in late February, early April and mid-May, the mean yields for the plantings were respectively 82.3, 82.7 and 80.0 bus. per acre. This crop had favourable growing conditions, it received 180 lb. of sulphate of ammonia at the first hilling, and it required only one irrigation of 2 in. to supplement rainfall.

A fertilizer and plant spacing trial produced results which indicated that a plant stand of 12,000 plants per acre is desirable on fertile soils of this area. To achieve such a stand with hybrid varieties, planting rates of up to 16 lb. per acre should be considered.

In comparing plant spacings and the effect of (i.) mung bean green manure with and without nitrogen, (ii.) nitrogenous fertilizer alone, and (iii.) fallow, the fertilized plots (95.1 bus.) significantly outyielded unfertilized (82.2 bus.). The green manure stimulated better early growth of the maize but yield increases were not significant. The crops from 9 in. and 12 in. plant spacing (92.0 and 92.1 bus. respectively) outyielded the 15 in. spacings (78.8 bus.) at the 1 per cent. level of significance.

Safflower.—Varieties 47-53T2 and 4-1 produced the highest yields, 1,370 lb. of seed per acre. The former strain, with 28.6 per cent. oil content, gave 371 lb. of oil per acre. The Horowitz variety, which is outstanding in southern areas of the State, produced only 892 lb. of seed with 23.0 per cent. oil, but this oil was of higher quality.

Tobacco.—In a trial in which rotation of Rhodes grass and tobacco is being studied, further trials are superimposed to evaluate methods of managing the grass, with particular reference to quality and chlorine content of leaf grown after the pasture phase.

In the initial year two acres were cropped, but most of the plants (variety Hicks) were held for seed production; they provided 4,000 oz. of seed for sale to growers.

General.—Trial plantings and seed production of a range of cowpea varieties were continued during the year. In the current season, experiments with maize and cotton are well established and high yields are forecast. The cropping programme has been initiated on the Oaky clay soils, and the first plantings of wheat, oats, linseed and canary seed appear to be successfully established. Land is now being prepared for tobacco plantings on which pathological and entomological experiments will be located. Pastures consisting of para grass and centro have been established, and grazing of these and other exploratory pastures will be commenced after the spring growth.

KAIRI.

The experimental programme at this Station is based on maize production, dairying and pig raising. Considerable attention is directed to investigation of pasture establishment and management methods, and trials are conducted with most of the fodder crops. The majority of the experiments are in large blocks to provide normal farming and grazing conditions and to permit the assessment of results in practical terms.

The spring months of 1956 were typically hot and dry; sporadic storm rains commenced in late September and increased in frequency and intensity during December. The wet-season rains were, as in last year, mainly in the form of storms commencing in December and ending abruptly in mid-January. A period of fine weather was followed by heavy storms in February, then drizzly weather during March. Two severe frosts were recorded during May.

Crops.

Maize.—The crops sown in December, 1955, made good growth and following the lay-by cultivation in late January very high yields seemed possible. However, the tropical cyclone on March 6-7 caused severe losses and 50 per cent. of crops were flattened or snapped off. Some value was obtained from the area containing formed grain by grazing with pigs, and small sections were also recovered for silage making.

The programme designed for 1955-56 was repeated and harvesting of the maize started in June. Good yields are forecast.

Oats.—Oats for grazing has again proved very valuable for maintaining dairy production during the winter months. Under fairly dry winter conditions crown rust was not as severe as in most years and varieties produced well. The new variety Benton was slightly superior to Bovah in yield, but Vicland, which had been the outstanding variety for some years, was a complete failure due to its high susceptibility to Victoria blight. Observations on rust resistance showed that Camellia and Klein were least affected, but as these are both late-maturing types, early planting would be necessary to obtain satisfactory hay yields. A reputed disease-resistant oats known as Saia, which belongs to a different species, is being tested during the current season.

In a grazing trial, Bovah, BVH4982 (a sister strain), and Klein each produced 4-5 tons of green forage per acre, of which 3 tons per acre were utilized in three grazings.

Time-of-sowing experiments with oats confirmed previous findings that the best results for grazing or haymaking are obtained by early planting, immediately after the wet season.

Weed control experiments in late-planted oats showed that post-emergence application of various salts of 2,4-D or MCPA 30 per cent. at ½ lb. acid equivalent gave more effective weed control than pre-emergence applications at the 1 lb. per acre rates. However, in years when early planting and vigorous development is possible, competition by weeds is less obvious, and the crop will remain reasonably clean if pre-emergence applications of weedicides have been made.

Wheat.—The incidence of disease in oats is so serious on the Tableland that studies have been undertaken to evaluate a range of strains and varieties of wheat for

REGIONAL EXPERIMENT STATIONS.

RAINFALL IN INCHES.

Month.	Hermitage.		Biloela.		Ayr.		Millaroo.		Kairi.	
	1956–57.	Means.	1956–57.	Means.	1956–57.	Means.	1956–57.	Means.	1956–57.	Means.
July	1·67	·98	2·83	1·33	2·11	1·71	3·97	No	·81	·80
August	·53	·95	·10	·73	·98	·48	1·32	past	·56	1·21
September	1·71	1·62	·62	·90	1·15	·29	2·40	record	1·40	·96
October	2·01	4·05	·56	2·04	1·16	·88	1·12	avail-	1·32	1·93
November	2·48	2·52	4·45	2·92	3·34	2·18	2·42	able	2·89	2·18
December	8·04	2·95	10·15	3·64	4·67	1·38	6·78	..	9·66	3·60
January	3·62	4·18	1·92	4·15	7·54	16·04	2·97	..	16·10	11·02
February	2·18	3·22	·54	4·85	6·90	9·72	5·09	..	7·19	10·99
March	1·30	2·57	1·28	3·74	6·55	8·20	2·86	..	5·62	9·99
April	·52	1·16	·21	1·66	·04	2·78	·17	..	1·98	3·65
May	Nil	1·41	Nil	1·62	1·11	2·94	·31	..	1.36	1·92
June	1·38	2·47	·89	1·57	·30	·87	·25	..	3·71	1·89
Annual Rainfall ..	25·44	28·08	23·55	29·15	35·85	47·47	29·66	..	52·60	50·14

grazing or dual purposes. In general, early-maturing types were not satisfactory, and there is a definite advantage from early planting, immediately after the wet season. Lawrence and Celebration are fairly reliable, and four strains obtained from the world-wide wheat collection studied at Hermitage in 1955 are considered worthy of further study.

Cowpeas.—Regional testing of new strains of cowpeas has been continued. The new variety Malabar produced 8 tons of green material per acre and suppressed weed growth. The effect of a 6-ton green manure crop of mung bean last year resulted in a 2-ton increase in green yield of the following oats for grazing as compared with production from fallowed land. A similar trial repeated in the current season showed that nitrate nitrogen levels increased for 40 days after ploughing in a green manure crop, and there was a marked improvement in the appearance of the oat crop being grown.

Other Crops.—The use of sweet potatoes, mangels and sweet sorghum for pig grazing has been further explored. A small coffee plantation yielded 2 lb. of parchment coffee per tree and the final product was considered to be of high quality.

Pastures.

In large areas of improved dairy pastures it appears that productivity of green panic-lucerne mixtures declines fairly rapidly in the second year, whereas Rhodes grass-lucerne maintains a reasonable level of production for three years. The latter pasture combination is superior during the winter periods when frosts occur. There is an obvious need for nitrogen either from fertilizer or from a vigorous legume component. Investigations have shown that *Glycine javanica* is a valuable legume and in stands of green panic it has stimulated grass production. Pastures have been successfully renovated by ploughing and sowing to *Glycine* and allowing the grass component to regenerate from seed or runners.

Rhizobia Trials.—Testing of new strains of rhizobia for inoculation of *Glycine* and stylo indicated that although one strain was highly efficient on stylo, better selections are required to obtain satisfactory results from *Glycine*.

Fertilizer Trials.—Applications of nitrogenous fertilizers are being employed to lengthen the growing season of summer pastures and to stimulate production and nutritive value. The use of 2 cwt. of sulphate of ammonia per acre increased production of Rhodes grass-lucerne pasture by 62-121 per cent. and green panic-lucerne pasture by 35-58 per cent. nine weeks after application, but there was no residual effect after the first grazing. In the current year, 4 cwt. applications to 3rd year pastures gave increases in production of 270 and 240 per cent. respectively from the two mixtures. There was a marked improvement in palatability of fertilized Rhodes grass. Fertilizing at the 4 cwt. rate appears necessary to obtain an economic response.

Nursery.—Several promising grass species are under study. The most outstanding—two species of elephant grass—have been multiplied, and a 5-acre pasture of these has now been established for large-scale feeding trials.

Plate 3.—Glycine javanica **and Kikuyu Grass Pasture at Kairi.**

Plate 4.—Elephant Grass (Right) and Panicum maximum **var.** typica **at Kairi. The elephant grass has been allowed to grow to provide planting material, but when carefully managed it provides very high yields of palatable and nutritious fodder.**

Livestock.

The Jersey dairy herd maintained on the maize-pasture rotation area averaged 291 lb. of butterfat per cow over the last completed lactation period. In addition to grazing pastures and oats, silage is fed during the dry winter period and a protein supplement is supplied to first-calf heifers.

Heifers for establishing an additional experimental A.I.S. herd have been purchased and production will commence in spring.

An A.I. centre has been developed and a laboratory and bull-yards, etc., have been constructed. It is anticipated that the section will commence operations in the near future.

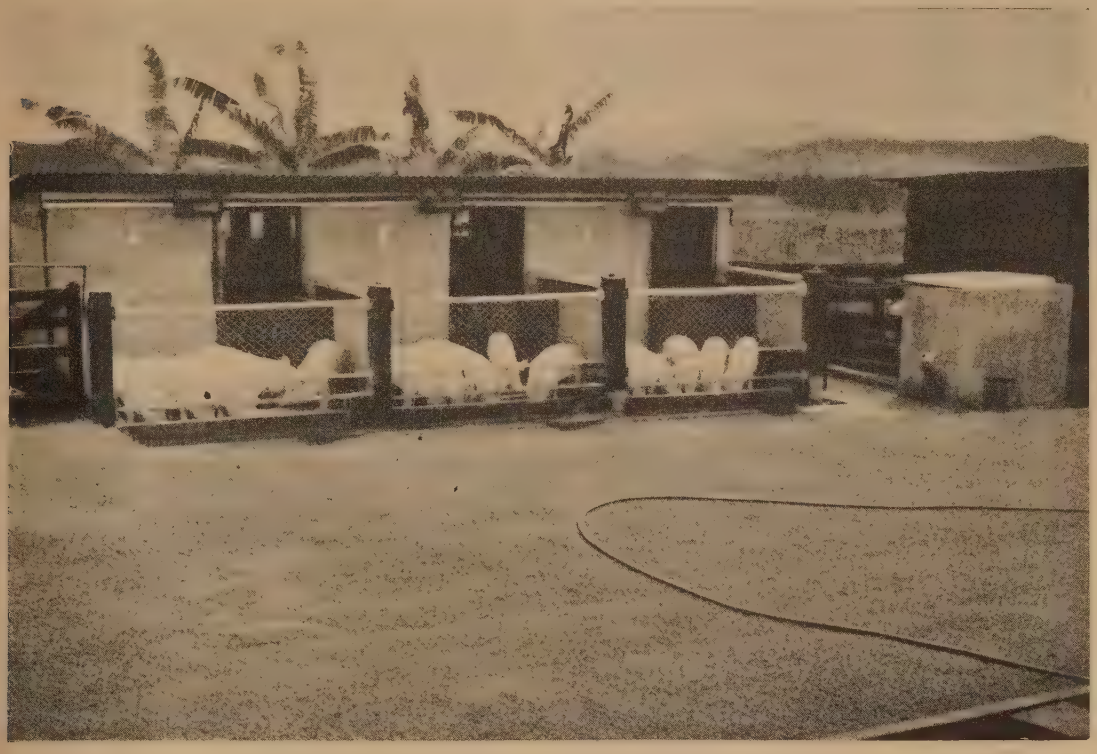


Plate 5.—Portion of Experimental Pens at the Pig Section, Kairi.

HORTICULTURE BRANCH.

Dr. S. A. Trout, Director of Horticulture.

Prospects for fruit and vegetable growers appeared bright at the beginning of the year, but drought conditions are now apparent in many areas. In some irrigated districts such as Redlands, where water supplies are limited, production in spring may be seriously affected.

Autumn production of vegetables on the coast is normally hampered by wet weather. The lack of summer rains simplified production of autumn vegetables, and yields per acre in all crops, with the exception of cauliflowers, were considerably higher than usual. As a result, markets were glutted in the February-June period.

The recession in prices for most fruits and vegetables has focussed attention on the need for efficient land management. During the last decade, returns per acre rose rapidly, and a considerable amount of subdivision took place in some areas. Many farms are now rather small for efficient land use, and this represents a problem of some magnitude in a number of horticultural districts.

Irrigation facilities are being developed rapidly, with emphasis on surface storage. It is estimated that the amount of impounded water in the Redlands district has doubled during the past three years.

Notable developments in horticulture are the tremendous impact of processing on production; improved storage methods which enable Granny Smith apples to be kept six weeks longer; a self-cooling railway wagon which overcomes the necessity to pre-cool consignments several days before loading; and the advent of the fibreboard carton, which coupled with bulk loading methods has eliminated bruising in Tasmanian apples consigned to Queensland and pineapples shipped to Tasmania.

PINEAPPLES.

The pineapple industry has not recovered completely from the loss of ratoon crops which followed heavy autumn and winter rains in southern Queensland during 1955 and 1956. The position was further complicated on the North Coast by relatively dry weather in the early summer of 1956-57, which reduced fruit size in the plant crop. Production for the year 1957 is expected to be 2,642,000 tropical cases, compared with 2,847,569 cases in 1956. Continued expansion of the area under crop in Central Queensland compensated to some extent for the reduced crop in the south.

Nutritional problems have received a great deal of research attention during recent years. Current emphasis is on the need for additional potassium in the fertilizer on most of the soil types used for pineapples in Queensland. The additional potassium not only increases yields per acre but also materially increases fruit acidity. The latter is particularly important in North Queensland, where high-potassium fertilizers may prove a solution to the recurrent problem of insufficient acidity in the fruit, which makes processing more difficult.

The tarred waterways featured by the advisory service provide a relatively cheap means of stabilising the soil and have proved invaluable for autumn plantings in which the surface soil is highly vulnerable to erosion during the wet season. Work is in progress to standardise the tar formulation, as all tars are not equally effective for waterway stabilisation.

Deterioration in soil structure is a particularly difficult problem in some parts of the North Coast as a result of farm subdivision during the post-war period. On the small farms practically the whole of the land is regularly cropped, and unless seasonal conditions are reasonably good, returns fall below subsistence level. There is no quick solution to the problem. At the moment, methods of farm management based on diversified cropping and efficient water utilization are being investigated.

Steps are being taken to reopen the Cairns cannery to handle the 1957 summer pineapple crop in North Queensland. The prospect of a more stable outlet for pineapples grown in this area has re-awakened interest in the crop.

In 1956, the incidence of black heart, which averaged 5 per cent. in the May-June period, rose to 25 per cent. in the July-August period, and this increase was closely related to lower diurnal minimum temperatures. Flower induction is now being applied by many growers in order to avoid harvesting their crop during the July-August period. For the May-June period of 1957 production was estimated to be about 100,000 cases more than in the corresponding period of any previous year.

The demand for glacé and crystallised pineapple is increasing, but standard methods of preparation are very time-consuming. A continuous syruping process which gives a high drained weight and a very attractive product has now been developed. Satisfactory coatings for glacé pineapples have overcome weeping and mould development in storage. Dehydrated crushed and sliced pineapples which reconstitute to an attractive product have been produced on an experimental scale. The reduction in bulk will save storage, freight and handling charges.

BANANAS.

The banana industry has now emerged from the 1954-1956 period of low prices, and production is fairly well related to demand. The earlier setback has been followed by a reduced area under crop and more restrained planting. Production for 1956 amounted to 460,438 cases (1¼ bus.).

The importance of strain types in the industry is indicated by the further increase in the area planted to Mons Mari. Parallel developments may occur in the variety Lady Finger. Methods for segregating good and bad types of Lady Finger banana have been worked out at Nambour. They are based primarily on flower characteristics, bell shape and imbrication of the bud. Should the scheme prove satisfactory, approval of plantations as sources of planting material may be granted only to those with a negligible proportion of inferior types in the stand.

Suckering methods have been investigated during the year. The results obtained to date suggest that kerosene injection is not only effective but also less harmful to the parent plant carrying fruit than mechanical methods of removing suckers.

Bunchy top continues to be troublesome on the South Coast, and the number of infected plants recorded showed a slight rise over that of the previous year. It was therefore necessary to rigidly enforce control measures prescribed by legislation. The outbreak recorded at Innisfail in 1953 has now been brought under control. Odd diseased plants are, however, still being found in the area, but it is hoped that eradication will be achieved within two years.

Methods of ripening bananas with ethylene and growth-regulating hormones have been investigated. In gas-tight rooms, an atmosphere containing 1 p.p.m. of ethylene ripens bananas, but in the commercial rooms so far tested much greater concentrations of ethylene are required. These concentrations are, however, very much less than those used in commercial practice. The ripening behaviour of bananas varies with seasonal conditions and with locality. Detailed studies are therefore required to investigate this variability. Some hormones accelerate softening but they have little effect on colouring; other hormones actually retard ripening.

The possibility of using bananas other than in the fresh state has been investigated. Laboratory trials have shown that bananas can be dried or quick-frozen satisfactorily.

APPLES.

The 1956-57 apple crop was a record, amounting to 809,000 bus. The varieties Delicious and Jonathan bore a better than average crop, but Granny Smith was slightly below normal. On mature trees, fruit size was reduced by dry weather in the later stages of fruit development but fruit quality was generally excellent.

Although fertilizer practices in the apple orchard have been standardised, soil analytical data collected during recent years suggest that both nitrogen and potassium are present in marginal amounts in many orchards. This has been confirmed by fertilizer trials, which indicate that the amount of nitrogen and potassium in the spring fertilizer may have to be increased substantially.

Deterioration of soil structure is apparent in many parts of the Stanthorpe district and the current practice of growing New Zealand blue lupin during the winter months may not be sufficient to remedy the position. Trials with permanent sod in which the dominant species is subterranean clover (Dwalganup strain) continue to show promise.

With the gradual increase in production now taking place in the Granite Belt there is a greater need to extend the marketing period of the crop by improved storage methods. Experimental work has already helped to eliminate wastage in the varieties Delicious and Granny Smith, by determining the optimum picking dates for cool storage and the effect of tree age on keeping quality. There is still a considerable variation in keeping quality between fruit from different orchards. Storage in an atmosphere containing about 5 per cent. carbon dioxide and 16 per cent. oxygen has extended the life of the Granny Smith by about six weeks, and this method is now being tried on a semi-commercial scale. The range of picking for fruit for this type of storage is restricted to the third week in April, because earlier fruit is very susceptible to superficial scald. However, remarkable control of superficial scald has been obtained by dipping the fruit in a solution of diphenylamine (DPA). The effect of DPA is not clearly understood but it is known to inhibit certain chemical reactions which cause discoloration. About 20 compounds with similar properties to DPA are being tested on Granny Smith apples this year.

Wastage in apples is related to the size of the fruit and of the crop. A technique has now been developed for measuring cell size and cell number, both of which are being recorded in the various trials now in progress.

It is normal factory practice to add powdered pectin as a setting agent to certain juices which are low in natural pectin. At the request of the Deciduous Sectional Group Committee, extracts from factory apples were tested for their suitability as setting agents for strawberry jam.

PEARS.

The 1956-57 pear crop was 50,500 bus.

In the past, supplies of pears for canning have been obtained from southern States, but in 1957 approximately 11,000 cases of Queensland pears were canned by the Northgate cannery. Experiments have been carried out to determine the optimum time of picking, the maximum length of storage life and the conditions of ripening necessary to give a good canning article. It was found that a very much longer period of cold storage is required to initiate ripening in pears harvested earlier in the season than in those harvested several weeks later. No advantage was therefore gained by picking the fruit early, particularly as it increases in size and improves in quality on the tree. Ethylene treatment accelerated the ripening of the Williams variety but had no effect on the Packham variety.

STONE FRUITS.

Stone fruits bore a medium to heavy crop in the 1956-57 season, production being:—peaches 180,322, plums 119,647, and apricots 35,839 cases (½ bus.). Fruit size and quality were good, and returns to the grower satisfactory.

Perhaps the main development during the year has been the experimental processing of Elberta peaches by Northgate Cannery; a steady expansion of production for processing can now be expected.

The use of DNOC (dinitro-ortho-cresol) for thinning plums, a procedure which was demonstrated in experiments during the 1953-1956 period, is now attracting followers. Several orchardists applied the recommended schedule this year and recorded reduced labour costs and increased size of the fruit harvested.

The beneficial effects which follow the use of the triethanolanime salt of 2,4,5-TP (trichlorophenoxy acetic acid) at a concentration of 50 p.p.m. in water were again demonstrated in apricots this year. Fruit size was increased, fruit appearance was outstandingly superior and the crop matured about one week ahead of schedule. Commercial application should increase rapidly, as higher returns are received for early fruit of good size and quality.

Certain varieties of peaches and plums are cool stored in the Stanthorpe district in order to regulate market supplies. Storage experiments have confirmed previous results that the life of the Wilson variety is 10–14 days and the Santa Rosa variety about 4 weeks at 32 deg. F. The life of the various Elberta types of peaches averages about 2 weeks, and no extension of life was obtained by storage in controlled atmospheres. Brown rot is still a major problem in the storage and transport of peaches. Chemical work in association with these trials has not revealed any simple method of determining fruit maturity.

GRAPES.

Although both yield and fruit quality in the grape crop were below normal in coastal areas, production of 115,882 bushel cases at Stanthorpe was a record.

Zinc and magnesium deficiencies which have been major troubles in some parts of the Granite Belt were not conspicuous, partly because of seasonal conditions and partly because remedial measures prescribed following Departmental trials are now being generally applied. The application of dolomite at intervals of two or three years to correct soil acidity and the frequently associated deficiency of magnesium is becoming standard practice. Swabbing pruning cuts with a zinc sulphate solution (2 lb. per gallon) is also becoming a routine operation during the annual winter pruning.

Pruning practices at Stanthorpe have for long set precedents for the less important grape growing areas of the State, but these methods require some modification in other districts. This problem is being investigated at the Redlands Experiment Station.

Grapes are sometimes stored in the Stanthorpe district, and exploratory trials have been carried out to determine the most suitable methods for obtaining maximum storage life. Work has also been continued on the effect of rootstock on chemical composition of the fruit. Results have been so variable from season to season and from variety to variety that no conclusions can as yet be drawn.

CITRUS.

Rainfall was wholly favourable for citrus during 1956 and the production of 653,302 bushel cases, including 160,827 cases of mandarins, was well above normal. In contrast, the 1957 crop will be below average because dry weather in autumn induced fruit fall in non-irrigated orchards and adversely affected fruit filling.

Considerable interest is being taken in new types of mandarins, and two seedling types known as Stemp and Hickson have been recommended for semi-commercial trial. Both have some of the characteristics of the Glen Retreat in quality and time of harvesting, but their tree type and cropping habit are considerably better. Other strains of mandarin may be obtained from the mandarin hybrid project at the Gatton Regional Experiment Station, where the trees are now bearing fruit. These are to be assessed during the current season.

Sod culture continues to make progress at Gayndah, where trials have been in progress for some years in irrigated orchards. Irrigation white clover shows considerable promise. It seems that at Gayndah sod culture may not only provide an answer to soil management problems but also permit the more efficient use of applied fertilizer.

The Citrus Budwood and Seed Distribution Scheme operated satisfactorily during the year; 140,000 buds and 135 lb. of seed were supplied to nurserymen. The demand for orange seed continues to increase at the expense of lemon seed for the production of stock trees. The proportionate demand for budwood of the several

varieties of citrus remains fairly constant. In view of possible changes in the stock requirements of the industry, steps are being taken to establish types such as Troyer and Cleopatra for seed extraction purposes at Kamerunga Experiment Station.

With a view to reducing mould wastage, the number of injuries which occur during the various stages of preparation of citrus for market have been determined by dipping the fruit in a 0.05 per cent. solution of 2, 3, 5-triphenyl tetrazolium chloride, which shows up injuries as bright red spots. Fresh injuries occurred at each stage of handling, and when the fruit was finally packed the injuries had increased ninefold as compared with freshly harvested fruit. No additional injuries occurred, however, after the fruit was packed, irrespective of whether wooden cases or fibre-board cartons were used.

Further outbreaks of fruit fly in southern States have focussed attention on ethylene dibromide (EDB) as a commodity treatment for the destruction of fruit fly in infested consignments. Work in Queensland has shown that Valencia oranges will tolerate a dosage of 2 lb. of EDB per 1,000 cu. ft. of air-space at 70 deg. F., while other varieties will withstand much higher dosages. The entomological work at Gosford with artificially infested fruit is nearing completion. The commercial application of this method is now being explored; if successful this should stimulate export of Queensland fruits to southern States.

Experimental work is also in progress to determine the storage life and optimum storage conditions for mandarins, for which there is a potential market overseas.

PAPAWS.

Papaw plantations were slow to recover from the heavy defoliation caused by high winds in winter and dry weather in the spring of 1956. Production was therefore only fair, and much of the fruit harvested in spring was only of moderate quality. The 1956 crop amounted to 428,723 bushel cases. Fruit set in the early part of the current season was extremely good, but dry weather in recent months reduces the prospects for 1957.

The influence of soil moisture on fruit set was demonstrated in a trial at the Maroochy Experiment Station. Results suggest that irrigation improves the crop spread and reduces wastage from ripe fruit rots. Irrigation also appears to increase the amount of fruit harvested in the autumn and early winter months when flesh quality is first class.

A range of locally selected plant types is now available; this should ultimately satisfy the requirements of the industry in southern Queensland. Two of the more important types are known as Sunnybank and Brookfield. Arrangements have been made for the production of seed of Hybrid No. 5, a utility strain of excellent quality and suitable for production in most parts of the State.

Fruit fly restrictions in southern States apply to papaws consigned from Queensland. The possibility of using EDB as a pre-consignment treatment for the destruction of fruit fly has been investigated. Fumigation before artificial ripening resulted in no injury to the fruit, but severe losses occurred when ripening preceded fumigation.

In cannery operations papaws are quick-frozen and held for subsequent use in fruit salad mixtures. Experimental work has shown that immersion freezing in a very cold solution of invert sugar gives a firmer and more attractive product than when freezing is done by air blast. Steps are being taken to apply this method on a commercial scale. Trials on artificial ripening have indicated that heat alone will accelerate softening and colouring but not to the same extent as when ethylene is used in conjunction with heat.

STRAWBERRIES.

The strawberry crop, valued at £180,000 for factory fruit and £70,000 for fresh fruit in 1956, is assuming major importance in Queensland. Over 1,400 growers are now engaged in strawberry production, compared with 943 in 1956, and plantings exceed 400 acres. There is an increasing demand by factories and the factory price has been increased to 2s. 3d. per lb. compared with 2s. in 1956.

Varieties potentially suitable for processing imported from the U.S.A. have now been placed in trials at the Redlands Experiment Station after several years' quarantine at Canberra.

Laboratory experiments have shown that the addition of a small amount of pectin improves the general appearance and texture of canned strawberries. Drying to 35 per cent. of the original weight prior to quick-freezing has given very much firmer and more attractive berries than direct freezing.

Plate 1.—Plate Freezer Equipment Used in Investigations of Quick Freezing of Fruits and Vegetables.

Weed control in strawberries is a problem unless pre-planting tillage is thoroughly carried out, but this is not always practicable during the summer months. Recent trials with some of the more modern weedicides indicate that the ethyl sulphate ester of 2,4-D may be useful. It gave good control of both grasses and broad-leaved weeds at the Redlands Experiment Station without any harmful effects on the plants.

The value of mulching was well demonstrated in a trial at the Redlands Experiment Station in an irrigated crop of strawberries, where increased yields were recorded.

AVOCADOES.

Avocado production shows a slight upward trend and this should continue as new plantings come into bearing. Production for 1956 was 4,349 bushel cases. Fruit quality was variable, being only fair in Fuerte, an early-maturing variety, whereas that of Nabal, a mid-season type, was particularly good. This difference was apparently due to seasonal conditions during the period of fruit development.

The industry depends mainly on Fuerte, Anaheim and Nabal, varieties which mature their fruit in that order over a period from April to September. In order to prolong the production period, a range of introduced types is now under test at the Redlands Experiment Station and elsewhere. The varieties Ryan, Hass and Sharwill may prove useful.

Extreme susceptibility of the avocado to waterlogged soils is a problem in the industry. The permeable clay loams, which are so popular for orchard purposes in coastal areas, appear to be marginal for the avocado even when the movement of soil water is accelerated by the installation of tile drains. Advisory policy is to encourage plantings on sands and sandy loams of suitable depth, preferably in areas where irrigation facilities are available.

A survey of avocado marketing methods made in Sydney in May, 1957, showed that methods of presentation require considerable improvement. Action taken to keep immature Fuerte fruit off the market was welcomed by agents, and returns for mature fruit have been greater than in previous years. Following chemical investigations over three years a minimum oil content of 15 per cent. was gazetted for the Fuerte variety.

The prospect of expanding the industry should be reasonably good when varieties and methods of presentation have been standardised. At present the market shows a strong preference for the pear-shaped Fuerte variety, which is of excellent eating and keeping quality. Seedling types are particularly unsatisfactory and are doing the industry considerable harm. Chemical and physical measurements are proceeding with the Anaheim and Nabal varieties with a view to prescribing suitable maturity standards.

PASSION FRUIT.

Passion fruit growing is still a struggling industry dogged by disease problems which reduce the life of the vine and make production somewhat speculative. The 1956 crop was rather better than usual and amounted to 17,094 half-bushel cases; this is much less than current market demand.

It has been established by officers of the Pathology Section that the golden passion fruit (*Passiflora flavicarpa*) has considerable resistance to Fusarium disease. Attention is therefore being given to perfecting grafting methods which would permit the commercial use of plants with a *flavicarpa* rootstock and an *edulis* scion.

An alternative possibility is also being explored. It involves selection within *flavicarpa* for strains which crop consistently and bear fruit of acceptable commercial quality, and hybridisation between *edulis* and *flavicarpa* with the ultimate aim of producing a new plant type with the essential requirements of disease resistance and satisfactory agronomic characters. Material is becoming available in increasing quantities, and intensive field testing has already begun.

MACADAMIA NUTS.

No change can be reported in Macadamia nut production, which amounted to 24 tons during 1956.

The quality of marketed nuts showed a considerable improvement following Departmental investigations and recommendations. A large proportion of the nuts marketed previously was collected at irregular intervals from the ground. Premium prices for quality kernels for processing have made systematic harvesting essential and stimulated interest in the crop.

The demand for grafted trees remains unsatisfied, and the position is not likely to improve until a concerted study of propagation methods has been completed. It has been impracticable to put such a programme into effect so far, but more detailed work on the subject is proposed next year.

Departmental officers assisted in the commercial processing of 12 tons of Macadamia nuts processed in 1956 and for which growers received a return of 6s. per lb. for sound kernels. The processors obtained a return for the kernels, which are being manufactured into plastic flour. Consumer demand for the salted, roasted kernels greatly exceeds present production Departmental investigations on processing have been concerned with improvements in keeping quality of the salted kernels. Cooking in oil immediately after cracking is desirable, while the time and temperature of heating should be such that the kernel is cooked throughout.

MANGOES.

The 1956 mango crop matured very irregularly as a result of the 1956 cyclone in North Queensland, which destroyed most of the previous crop and damaged a considerable proportion of the trees. Some overlapping in times of production of the several varieties tended to confuse the market and upset demand. The progress recently reported in this crop is being maintained and will probably increase as the need for more diversified cropping in the dry tropics becomes better appreciated. Production in 1956 was 46,226 bushel cases, compared with 31,851 cases in 1955.

GINGER.

Interest in ginger growing in the North Coast district has been revived, but shortage of suitable seed is restricting plantings. The 1957 crop of ginger was therefore grown primarily for seed with a view to establishing a sizeable industry in future years.

Departmental investigations have been concerned with cultural practices and processing methods. Processing methods have shown that treatment with hot water at high pressure is a satisfactory way of peeling the ginger in lieu of hand peeling. Sodium benzoate was much more satisfactory than sodium bisulphite now used commercially for storing ginger prior to processing. Crystallizing with raw sugar gave a much more attractive and palatable product than crystallizing with refined sugar. The commercial application of Departmental findings has greatly increased the standard of quality of the commercial pack, which is now rated at least equal to the imported product.

FIGS.

Fig production appears to be declining due to the high cost of production and the limited demand for the fruit. Production in 1956 was 3,640 bushel cases, compared with 5,829 cases, and factory deliveries 96 tons, compared with 146 tons in the previous year. There is a limited demand for fig jam, but outlets are available for dried figs when a suitable method can be found. Laboratory investigations have shown that very attractive dried figs can be produced by blanching the fruit in hot water, boiling in a concentrated syrup containing 0.2 per cent. of sulphur dioxide, followed by dehydration for about 12 hours.

CUSTARD APPLES.

Custard apple production is expanding and the fruit is popular on southern markets. Production in 1956 was 18,323 bushel cases, compared with 14,193 cases in 1955. The production per tree is still too low, and this problem is being investigated in a stock-scion trial at Redlands Experiment Station.

TOMATOES.

Tomato production showed an increase during 1956-57 in spite of the partial failure of the late summer crop at Stanthorpe owing to lack of rain. The reduced production in this area was more than offset by high yields in coastal districts during the autumn months. The 1956 crop was 1,365,553 half-bushel cases from 5,530 acres.

The varietal position shows little change and Queensland bred Q types remain the backbone of the industry. Q5, a Rutgers selection which takes the place of Q4, entered into commercial production on a sizable scale. It bears well and fruit quality is exceptionally good, except on the more fertile soils, where "catface" is rather pronounced in the basal hands.

Plate 2.—Q3 Variety of Tomato, Bred by the Horticulture Branch. It is grown extensively in the Bowen District as an irrigated winter crop.

Some varieties from overseas were incorporated in winter trials at Redlands in 1956, and Queen may prove useful as a replacement for the cluster types normally grown in that area during cold weather. Limited amounts of seed have been made available for semi-commercial trials.

Faulty setting in globe varieties of tomato is a hazard in autumn-planted crops on the coast if winter sets in early. A study of fruit set under artificial covers and in plants sprayed with Duraset (meta tolyl phthallamic acid) was therefore made in a winter crop. The data indicate that fruit set in the variety Q2 only occurs when temperatures remain above 45 deg. F. for at least five days after the blossoms open. Spraying the flower clusters with Duraset at a rate of 2 lb. per acre induced setting when conditions were otherwise unfavourable.

One of the most notable changes in the industry has been the adoption of the parallel wire trellis in tomato growing areas. In the Redlands area, about 95 per cent. of the crop is now grown under this system. Ease of picking and a reduced amount of waste fruit are its principal advantages.

BEANS.

Bean production was far in excess of the market demand, particularly in the January-May, 1957, period, when most crops yielded well. The area planted in 1956 was 4,831 acres, from which 539,569 bus. were harvested.

The varietal position shows little change, although in some areas the heavy-yielding Wonder types are increasing in popularity. This trend may mean little in an industry which places such a high premium on quality. The importance of quality may similarly determine the fate of selections from the Florida Belle-Langshaw Beauty cross, which are now undergoing quantitative trials prior to release for commercial production. The best of these appear to be heavier yielding than Brown Beauty, of comparable quality and with the added merit of commercial resistance to rust, a problem in some districts.

Trials are in progress to determine the effect of climatic selection on strain survival in field run Brown Beauty, which is a mixture of pure lines. The data so far available suggest that increased production of green beans in winter may necessitate the use of selections with greater tolerance to low temperatures.

Sufficient mother seed was grown under certification rules to plant some 300 acres for commercial seed production. Yields per acre were only fair, and several crops failed to measure up to the standard necessary for the green bean industry. Nevertheless, some 1,400 bus. of good quality disease-free seed was placed on the market. This represents about one-quarter of Queensland's present requirements. Commercial seedmen are becoming interested in bean seed production at Kingaroy and in the dry tropics, where the crop is grown under irrigation.

The effect of additional potassium in the fertilizer mixture was checked; results confirmed that the plant has a low potassium requirement.

CRUCIFERS.

Supplies of cabbage have been freely available during the year. The position in cauliflowers was less satisfactory; yields per acre and head quality were well below average due mainly to lack of soil moisture in some areas. Production for 1956 amounted to 353,875 doz. cabbage from 1,220 acres and 132,665 doz. cauliflowers from 552 acres.

The sensitivity of quick-maturing cauliflower varieties to stress conditions was demonstrated in 1957. Russian 2A behaved better than Snowball strains in trials at the Redlands Experiment Station, but even under irrigation head quality was only fair and a large proportion of the heads were classed as unmarketable.

There has been increased interest in brussels sprouts but few experimental data on the crop are available here.

CUCURBITS.

Production of cucurbit crops continues to increase. The current demand is for cucumbers such as Palmetto and Marketer, and rockmelon varieties such as Rio Gold. Production for 1956 was 141,818 bushel cases of cucumbers from 975 acres; 1,138 tons of rockmelons from 440 acres; and 4,457 tons of watermelons from 986 acres.

The good performance of some new disease-resistant varieties of cucumber and rockmelon has helped to stabilise the industries; growers can now plan their production programmes with some certainty. Of the rockmelons, Rio Gold is outstanding in disease-resistance, appearance and flesh quality.

ROOT CROPS.

The area under carrots and beetroot is steadily expanding, and production is extending over an ever-increasing period of the year. Production for 1956 amounted to 34,800 cwt. of carrots from 424 acres and 28,899 cwt. of beetroot from 512 acres.

A major development in the carrot crop has been the use of pre-germination weedicides. Formerly, the practice was to apply power kerosene or white spirit to the crop in the fern-leaf stage to suppress grasses and other weeds. The present practice, which has been experimentally tested at the Redlands Experiment Station, is to apply an initial white spirit spray in the row about two days before the anticipated time of germination and again in the fern-leaf stage some two weeks later. Carrot spacing was also investigated during the year. Results indicate that any form of thinning involves a reduction in total yield of roots.

SALAD VEGETABLES.

Lettuce is still the principal salad vegetable, although celery is attracting an increasing number of growers both at Stanthorpe and in coastal southern Queensland. Market supplies of these crops during 1956 were 250,763 bushel cases of lettuce from 286 acres and 6,024 bushel cases of celery from 11 acres. The results obtained in varietal trials at the Redlands Experiment Station are now being applied by lettuce growers generally.

The frequent collapse of late autumn and early winter plantings is still a problem. Typical symptoms are a stunting in growth and a discoloration of the pith of the stem and roots. Available evidence suggests that the trouble may be due in incorrect fertilizer usage, and this point will be checked during the coming year.

PROCESSING OF VEGETABLES.

The production of processed vegetables has increased almost four-fold in Australia in the last decade, and some attention may have to be given to processing vegetables in Queensland, particularly with a view to stabilising market supplies. Gluts of tomatoes, beans and other vegetables occur periodically. Canning is not a very satisfactory way of preserving vegetables, and dehydration and quick freezing methods are now employed. A new method called dehydro-freezing, which avoids the necessity to dry foods for a very long time and reduces the bulk which has to be frozen, has become popular overseas. It has been applied successfully on an experimental scale to several vegetables grown in Queensland. The method involves blanching the vegetable to inactivate the enzymes, drying to 50 per cent. of the original fresh weight and then quick freezing.

Tests have also been carried out to determine the varietal suitability of potatoes for crisp manufacture. The Walanga variety gave a significantly higher recovery than other varieties, but there was no difference in colour or flavour of the crisps from the four varieties tested. The overall quality of the crisps deteriorated as the storage period of the fresh potato was prolonged, and immediate processing appears necessary. Bubbling, a serious defect in the commercial pack, was overcome by perforating the freshly cut slices just prior to cooking.

Mushrooms, grown quite extensively in Queensland, are normally preserved by canning, but very satisfactory results have been obtained by dehydrating them.

EXPERIMENT STATIONS.

The work of Horticulture Branch Experiment Stations has become increasingly important but is limited by the shortage of technical staff to undertake fundamental research. Industry organisations now make full use of the stations as focal centres for group discussions and advisory functions. The stations are therefore tending to become not only research but also demonstration areas.

Although the Maroochy Experiment Station is primarily concerned with research in plantation crops, such as pineapples, bananas and papaws, an attempt has been made to meet the needs of bean growers on the North Coast by establishing varietal and strain trials on a limited scale.

At the Redlands Experiment Station the overall programme has changed, soil investigations taking the place of the varietal trials which were a feature of work during the past six years. The plant breeding programme in tomatoes and beans is, however, being expanded because it promises to solve important production problems in established varieties, particularly losses from disease and low temperatures. A glass-house especially designed for plant breeding work is being erected; costs are being met by the Other Fruits Sectional Group Committee and the Vegetable Sectional Group Committee of the C.O.D.

Plate 3.—Cabbage Variety Trial at Redlands Experiment Station. Note the sugar-cane windbreaks.

Further progress at the Kamerunga Experiment Station is not possible until the technical staff is increased and irrigation facilities are improved. The Station, however, serves a useful purpose as a propagation and holding centre for crops of actual or potential importance in the North.

At Ayr Regional Experiment Station, the equipment is adequate, but with the existing staff it is difficult to handle both long-term experimental projects and urgent advisory commitments in fruit and vegetable crops.

Detailed plans and specifications of the Food Preservation Laboratory at Hamilton have been completed, and an additional area of land has been reserved for an electricity sub-station to serve the laboratory.

EXTENSION.

Extension services have been considerably hampered during the year by restrictions on travelling, which have reduced the supervision of field staffs by senior officers and confined farm visits to the more closely settled areas. News items, press releases, broadcasts and feature articles have therefore been used freely to provide the necessary coverage to fruit and vegetable growers. In addition, group discussions and field days have been used extensively.

The Advisory Committees on the main fruit and vegetable crops function satisfactorily. They meet regularly to discuss industry problems and to plan research and extension programmes.

Particular attention has been given to efficient land use, with emphasis on better drainage, practicable rotations, thorough pre-planting tillage and the need for planting high-yielding varieties of known merit.

The Horticulture Branch is fortunate in having as a publicity medium *Queensland Fruit and Vegetable News*, a weekly journal published by the C.O.D., primarily for fruit and vegetable growers. It provides space for a wide range of educational material and informed comment on current production problems.

The school packing classes have been continued in the Stanthorpe, Metropolitan, North Coast and Bowen districts and 500 pupils received instruction during the current year.

REFRIGERATED TRANSPORT.

Heat leakage measurements were made at Roma Street, and transit tests to Mt. Isa, Longreach and Cairns were conducted during the winter and summer months, with a railway wagon containing six electric fans of a standard American type manufactured by the Preco Company of California. A full report covering all experimental work has been circulated.

As a cooling system, the Preco wagon is more efficient than most conventional cool stores. This is most important, because consignments can be loaded direct from the market floor and cooled down during transit. This has overcome the difficulty previously experienced in having to pre-cool consignments for several days prior to transit in a wagon without fans. In January, a consignment of peaches and plums loaded direct from the packing sheds at Glen Aplin into the Preco wagon arrived in Cairns in an excellent condition, while similar fruit transported in a louvred wagon was completely wasty on arrival.

The major technical problems of transporting fruits and vegetables have now been overcome, and the way is open for a wider use of refrigerated transport in Queensland.

PACKAGING.

In conjunction with manufacturers and other State Departments a number of experimental consignments of apples from New South Wales, Victoria and Tasmania, and citrus fruits from New South Wales, were sent to Brisbane in 1956 to compare the improved telescopic waterproofed fibreboard carton with the wooden case as a fruit package. A considerable amount of detailed work has been necessary to determine the nature and extent of bruising at each loading and unloading point. It does appear that bruising is less in fibreboard cartons than in wooden cases, but more detailed experiments are planned for 1957. The present carton has been made slightly smaller than the Canadian Standard case in order to overcome the problem of slack packs. Experiments are now in progress in the various Australian States to determine whether the present dimensions are entirely satisfactory.

Wastage from bruising in Tasmanian apples marketed in Queensland is of the order of 25 per cent. With a view to reducing this wastage, experiments were designed in conjunction with the Australian Paper Manufacturers Limited and Tasmanian growers to test bulk loading methods and special steel crates holding 24 fibreboard cartons of apples. Bruising was eliminated in several trial shipments of apples from Hobart to Brisbane. This method has now been applied very successfully to shipments of Tasmanian apples sent to the United Kingdom and also to pineapples sent from Brisbane to Hobart.

Another experiment on packaging is concerned with polythene containers for reproducing conditions similar to controlled atmosphere storage, which has proved successful for Granny Smith apples. Various types of paper, plastic and jute are also being tested as to their suitability for citrus fruits. Cases and labour for packing have now become major items of expenditure in fruit production.

EXPORT.

During the year 1,685,000 packages of fruit and 1,654,000 packages of vegetables were exported interstate. Brushing equipment was installed at several large packing sheds in the Granite Belt in order to remove spray residue which had previously been a problem in overseas export.

It was anticipated that consignments of early Granny Smith apples would be sent to the United Kingdom, but suitable shipping space could not be obtained. In view of the extremely favourable conditions in the United Kingdom for apples shipped from Australia in February, experimental work has been conducted to determine the earliest date at which Stanthorpe apples can be picked for export. Under the Commerce Export (Fresh Fruit) Regulations the earliest date is now Mar. 1. Results have shown that February pickings of fruit of 2¼ in. diameter are satisfactory for export, but fruit of 3 in. size is severely affected by bitter pit.

Exports to Hollandia, New Guinea and Singapore totalled 15,000 cases of fruit and 8,000 packages of vegetables. Exports of citrus fruits, particularly mandarins, are expected to increase during 1957.

PLANT QUARANTINE.

About 3,500 plants, mainly orchids, were received from England, U.S.A., Japan, New Guinea, France, Holland, Fiji, Solomon Islands and New Zealand. In addition, 14,286 logs, 119,204 pieces of timber, 1,227 bundles of plywood, 121 merchandise crates, 4,184 bundles of case timber, 1,083 bales of cotton waste and 2,036 bales of cotton were imported. Due to the pre-consignment treatments now required under the quarantine regulations, only a small proportion of the timber imports had to be treated after arrival. Bulbs have now been included under the nursery stock regulations, which require that every importer be an approved authority and that plants be grown for a period under strict isolation. There are now 60 approved importers in Queensland, the majority of whom are orchid growers. Compulsory fumigation of orchids at the port of entry does not apply to orchids maintained in proper orchid houses, subject to frequent inspection and certified as free from pest and diseases by a recognised authority. New regulations covering the importation of soil are being drafted, following many requests to import samples of mineral sands from overseas.

Plant quarantine services are operating efficiently through the vigilance of postal and customs officers and the excellent co-operation from transport authorities and importers. Conditions covering the trans-shipment of goods from other States have been tightened to ensure that all materials consigned to Queensland are first inspected at the port of Brisbane. Because of the shortage of certified bean seed in Australia, conditions of importation now permit the entry of seed from any countries which have a Bean Certification system with standards similar to the Australian. Additional services have been provided at airports for the inspection of overseas planes which arrive during the night. Fumigation of plants with methyl bromide is proving entirely satisfactory, and facilities have now been established at Cairns.

The quarantine publicity campaign sponsored by the Australian Agricultural Council is working satisfactorily, and additional posters, films and stickers have been distributed throughout Queensland.

Plate 4.—Tasmanian Loading of Apples Packed in Fibreboard Cartons Enclosed in Steel Crates for Shipping to Queensland. The Crates Contain Cases of Pineapples on the Return Trip.

SCIENCE BRANCH.

Botany Section: Mr. S. L. Everist, Government Botanist.

Entomology Section: Dr. W. A. McDougall, Chief Entomologist.

Plant Pathology Section: Mr. J. H. Simmonds, Chief Pathologist.

BOTANY SECTION.

Identification of plants, advisory work on weeds and weed control and maintenance of the herbarium and library accounted for most of the activities of the Branch during the year. However, some progress was made in monographic work on certain groups and in preparation of material for a new Flora of Queensland.

IDENTIFICATION AND ADVISORY WORK.

Although dry conditions prevailed over much of Queensland for most of the year, approximately 9,500 specimens were received for identification. Of these, about one-third were sent by Departmental officers, one-third by farmers, graziers, school teachers, pupils and gardeners, and one-third by other State and Commonwealth Departments, chiefly the Foresty Department and C.S.I.R.O. The conditions did influence to some extent the kinds of plants which came into prominence. For example, shallower rooted weeds, so common over the past few years of good seasons, were replaced by deeper rooted ones. Because of the dry season, animals ate more shrubby plants than usual and this resulted in an increase in the number of enquiries concerning poisonous plants and of stomach contents received for examination. There was less demand for information about tree planting.

More than 500 plant names were checked for accuracy before inclusion in papers by specialist officers in other spheres.

TAXONOMY.

Genera studied critically during the year included *Alternanthera, Amaranthus, Archidendron, Baeckea, Beilschmiedia Citriobatus, Eurycles, Melaleuca, Micromyrtus, Ostrearia* and an allied new genus, *Paspalidium, Pithecellobium, Plectranthus, Rumex* and miscellaneous groups of the Proteaceae and Cruciferae.

Two taxonomic papers, entitled "New Species of and Notes on Queensland Plants" and "A Synthetic New Species of Phalaris (Gramineae)," were published in *Proceedings of the Royal Society of Queensland*, Vol. 67.

WEEDS.

Three new weeds were reported from the State—skeleton weed (*Chondrilla juncea*), stinkwort (*Inula graveolens*) and spotted golden thistle (*Scolymus maculatus*). Of these, skeleton weed and stinkwort are serious weeds in some of the southern States and their appearance in Queensland is a matter for concern. Publicity was given to both plants and action is being taken, in conjunction with the Stock Routes Co-ordinating Board, to eradicate the known areas and to keep a close watch for further infestations.

The spread of giant sensitive plant (*Mimosa invisa*), a serious weed of sugar cane which has been established in the Innisfail-Tully area for more than 13 years, caused considerable concern in North Queensland. With Mr. A. P. Dodd of the Department of Public Lands, a visit was made to the Innisfail-Tully area to discuss means of control of this plant and to make recommendations to the Co-ordinating Board on a new approach to the whole problem of controlling this serious pest. Outside these old established areas, plants were received from Mackay, Ingham and Proserpine. In each case these were from small infestations which followed planting of centro seed imported from Malaya. Action was recommended to prevent further infestation from this source.

Groundsel bush (*Baccharis halimifolia*) was reported from the Darling Downs as far west as Drillham and from the South Burnett district. Paterson's curse (*Echium plantagineum*), yellow burr-weed (*Amsinckia intermedia*) and star thistle (*Centaurea calcitrapa*) were prominent among the deeper rooted weeds favoured by the abnormally dry spring.

In England, two new hormone-type weedkillers, 2,4-DB and MCPB, have recently been used for the selective control of broad-leaved weeds in clover pastures. Small-scale preliminary trials of these chemicals indicated that they were no more selective in controlling wild radish (*Raphanus raphanistrum*) in a young clover pasture than conventional formulations of 2,4-D. However, the new chemicals did show some promise on green cestrum (*Cestrum parqui*), a woody plant difficult to kill with other hormones. Further work with these chemicals on woody plants is justified.

In connection with Noogoora burr, the most serious weed in this State, a visit was made to Canberra with Mr. A. P. Dodd of the Department of Public Lands. Following discussions with C.S.I.R.O. officers, proposals were put forward for further work on the biological control of this plant.

Kapok bush (*Aerva persica*), a native of the Middle East, appeared for the first time in Queensland at Chillagoe. It was apparently brought in with seed of buffel grass from Western Australia. In that State it has proved useful as a fodder on poorer soils but further observations are needed here to determine whether it may displace more useful plants on the better soils of northern and western Queensland.

BRIGALOW.

Work on brigalow spraying was limited to an inspection of all aerial spraying experiments, and to an inspection of 2,000 acres sprayed by the Sub-Department of Native Affairs at Duaringa.

These confirmed earlier indications that big virgin brigalow is very susceptible to 2,4,5-T esters and that aerial spraying with rates as low as $\frac{1}{3}$ lb. 2,4,5-T acid equivalent per acre can give a high percentage kill of trees to ground level. On this basis the recommended rate of 2,4,5-T for aerial spraying of this kind of brigalow was reduced from 1 lb. to $\frac{1}{2}$ lb. per acre.

On brigalow sucker regrowth results have remained inconsistent and in some cases too poor to be economic. Much more research is needed on this type of brigalow if aerial spraying is to be used with success.

On the other hand, the excellent results from aerial and ground spraying of very young suckers following a burn are still in evidence. Three years after treatment the areas sprayed with 1 lb., $\frac{3}{4}$ lb., and $\frac{1}{2}$ lb. 2,4,5-T per acre were well grassed, with only a few scattered suckers, whereas those left untreated were still carrying about 8,000 clumps of suckers per acre and very little grass. As noted in the last annual report, aerial spraying of 2,4,5-T in oil gave better results at low rates ($\frac{1}{2}$ lb. per acre) than the same chemicals emulsified in water and applied with ground equipment. At rates exceeding $\frac{3}{4}$ lb. the results were comparable.

Burning of about 30 acres of virgin brigalow sprayed in 1951 at rates of 1, 2 and 3 lb. mixed 2,4-D/2,4,5-T per acre has not caused any serious suckering. On this area one spraying has been sufficient to control the brigalow and allow native pasture to develop. An area of suckers about 15 ft. high sprayed similarly at the same time was also burnt. The fire killed the new suckers which appeared two years after the original spraying, but some more suckers came up after the burn and these will need further observation. Even so, the net result six years after a single spraying is that the area of dense suckers, difficult to control by other means, has been converted to useful grazing land.

SUSPECTED POISONOUS PLANTS.

The evidence against 55 suspected poisonous plants was sufficient to warrant adding it to the poisonous plants files. Feeding tests of golden billy buttons, (*Craspedia chrysantha*) and cocky apple (*Planchonia careya*) were suggested to the Division of Animal

Industry. Further evidence on the toxicity of wild parsnip (*Trachymene glaucifolia*) suggested that new feeding tests are desirable. The plant is known to be capable of causing inco-ordination in adult sheep and is strongly suspected of causing bone deformation in lambs. New feeding tests are needed to determine whether this effect on lambs can be produced experimentally with plants taken at different stages of growth either by feeding the pregnant ewes or by feeding the lactating ewes and young lambs.

HERBARIUM AND LIBRARY.

In continuation of the re-arrangement of the herbarium, all native Dicotyledons have now been placed in proper folders. This work is now at a standstill pending the provision of additional storage space. About 7,000 specimens were mounted, 2,500 of which were new ones being incorporated.

Specimens received on exchange numbered 1,103, and 246 were sent out; 722 were forwarded on loan to specialists and 466 were received on loan from other institutions for special study.

Additions to the library totalled 67 volumes (excluding periodicals) and 61 volumes were bound. Cataloguing of all books and reprints in the library was completed, but shelving is still inadequate to allow of systematic arrangement.

ENTOMOLOGY SECTION.

For the greater part of the year dry weather was experienced in all districts from Rockhampton south. Insect pests have been controlled reasonably well throughout the State, but mites proved troublesome in many crops. With no unusual or completely new problems requiring urgent attention, research has proceeded satisfactorily along planned lines.

In the extension field, the misuse of modern insecticides so readily available is causing some concern. Despite experience with balanced and well proven control programmes, there is a tendency to try prematurely on a commercial scale many of the new materials offering. The excessive use, and often poorly timed applications, of insecticides are also adding to the cost of production, and at the same time have increased the status of some pests to an extent where further control problems have been created.

DECIDUOUS FRUITS.

The low level of codling moth (*Cydia pomonella* (L.)) populations interfered with progress in orchard trials with this pest. No evidence was obtained which would warrant alterations to the present commercial control programmes. Prolonged dry weather and mite activity resulted in premature leaf fall in many orchards. The European red mite (*Metatetranychus ulmi* (Koch)) was recorded for the first time in Queensland and was found in several Stanthorpe orchards. Detailed mite studies, including species surveys and orchard trials mostly with organo-phosphates, were undertaken during the warmer weather, and useful information towards improving the control of the mite complex was obtained. The project concerned with arsenic residues on apples has been finalised. To avoid undesirable residues of lead arsenate, sprays should not be used later than early November in Stanthorpe orchards, and for preference this insecticide should not be used at all, as satisfactory substitutes are readily available.

TROPICAL FRUITS.

Standard controls proved satisfactory against pests which might have proved troublesome. Investigational work, mostly long-term projects, on nematodes associated with bananas and pineapples was continued.

CITRUS.

Spraying was not unduly affected by the dry conditions. Late summer broods of white wax (*Ceroplastes destructor* Newst.) were smaller than last year, both on the coast and inland, but this pest is still prevalent. Fruit drop caused by fruit-sucking moths (*Othreis* species) was negligible in all districts, and the light incidence has delayed further work with these pests. Results from large-scale orchard trials in the Gayndah and Nambour districts indicate that the spray programmes for the control of common citrus pests published during the year will not require any appreciable modifications for the coming season.

FRUIT FLIES.

Losses caused by fruit flies were not severe under orchard conditions when reasonable care was taken, and most of the numerous enquiries on control of these pests were from suburban areas. Field and laboratory experiments, particularly on behaviour, were carried out in south-eastern Queensland, and field work has been expanded further to cover the far western and far northern parts of the State. Intensive research with insecticides has demonstrated that DDT is still the most efficacious material against fruit flies under Queensland conditions.

TOBACCO.

No severe insect infestations were recorded and the recommended Departmental pest control programme was used generally by farmers. Aerial spraying appeared to do a satisfactory job where collapse of crops prevented ground applications. It cannot be too strongly stressed that when pests are prevalent in tobacco fields timely applications of insecticides with thorough coverage will be essential. Research has been centred on general seed-bed investigations, and nematode control in seedbeds and fields. All data obtained have again demonstrated the careful work necessary, both in experiments and under commercial conditions, when dealing with pests of tobacco. Heat sterilization of seedbeds is still the best treatment towards producing healthy seedlings, and further information is required before the use of any modern chemical can be confidently recommended as a satisfactory alternative. A study of nematodes which may be concerned with root rots has been commenced.

FORESTRY.

Investigations covering bagworm (*Hyalarcta hubneri* (Westw.)) in *Pinus* plantations at Passchendaele, cedar shoot borer (*Hypsipyla robusta* Moore) at Imbil, and rats in young pine plantations in the Yarraman district have been continued throughout the year. Rat populations are naturally on the wane and only negligible damage can be expected until another upsurge is experienced. Results of experiments with maple seedling gall in North Queensland nurseries show that mites are not responsible for this trouble. The European house borer (*Hylotrupes bajulus* L.), which was introduced in imported houses, has been given further attention.

NEMATODES.

The strawberry nematode (*Meloidogyne hapla* Chitwood) has been found widely spread in south-eastern Queensland: satisfactory control measures have been devised and published. In addition to relevant work mentioned elsewhere in this report, detailed attention has been given to nematodes associated with bananas, citrus, pumpkin, tomato and other small crops. Particular attention is being given to evaluations as economic pests, which means that yield data from trials and general observations over several seasons will be required. Species surveys have been continued, and intensification of nematode investigations in North Queensland is being planned.

PASTURES.

Progress has been made with the problems of white grubs (Melolonthidae) and funnel ants (*Aphaenogaster* species) in coastal districts, and with seed-harvesting ants in pastoral areas. Insecticides are of little practical value against the first two groups of pests. The economic value of pasture renovation against white grubs, however, has been demonstrated, and the agronomic approach to the control of funnel ants is giving promising results. Planting in strips protected by dieldrin is a distinct help in dealing with seed-harvesting ants.

VEGETABLES.

During spring, mites (*Tetranychus* species) were present on beans in the far north, and bean fly (*Melanagromyza phaseoli* (Coq.)) was responsible for some losses in the Near North Coast districts. The

cabbage white butterfly (*Pieris rapae* (L.)) required attention by most growers, and pests of potatoes were more prominent than usual. In general, however, pests of vegetables were not particularly troublesome. This was due to dry conditions and the use of insecticides. Despite what might appear as a satisfactory state of affairs, vegetable pest control is a matter of some concern, particularly as regards costs, and steps are being taken to improve the overall position. A balanced control programme for tomato pests has been publicised, and further efforts will be the publication in the near future of a consolidated potato pest control programme, recommendations for the control of pests of the cabbage family, and the technical data on which these extension articles are based. Studies of parasites of vegetable pests have also been commenced.

MISCELLANEOUS FIELD CROPS.

On the Darling Downs during August and September cutworm infestations, mostly *Agrotis infusa* (Boisd.), were widespread, and extensive spraying from ground and air was carried out. Pests were not severe in linseed, and many of the insecticide applications were superfluous. Under the unusually dry summer conditions good crops of sorghum were grown with negligible interference by midge (*Contarinia sorghicola* (Coq.)). Low pest populations were encountered in cotton and lucerne. Intensive investigations concerning pests of field crops have been continued, with emphasis on some of the more fundamental aspects. One important project is the revaluing of the status of some pests where irrigation has become standard practice.

MISCELLANEOUS.

Some grain storage problems, particularly those concerned with rodent damage on farms and weevil infestations, have been given further attention, and suitable extension articles are being prepared. Work is also being undertaken on various ant problems of a minor nature, pests of cape gooseberries, sweet potato, strawberries, lawns and bowling greens. During autumn the grass caterpillar (*Psara licarsisalis* (Walk.)) was prevalent but highly parasitised; damage was localised and not severe. As a necessary adjunct to economic work various officers have continued their studies on Coccoidea, Dacinae, Agromyzidae, Thysanoptera, Aphididae and plant parasitic nematodes; several relevant articles were published during the year.

BEEKEEPING.

Early in the year good quantities of honey were produced. Later, dry conditions in the principal beekeeping districts adversely affected production. At March 31, 1,281 beekeepers were registered, an increase of 163 on the previous registration year. Inspectional work covered 3,152 colonies in 62 apiaries at 26 localities. Nosema disease (*Nosema apis* Zander) was recorded at Graceville, Bowen, Barcaldine, and Turallin, American foulbrood (*Bacillus larvae* White) at Limevale, and European foulbrood (*Bacillus alvei* White) at Maryborough. Extension services were increased by holding a beekeeping school which comprised a series of lectures and field visits to selected apiaries. A field day at the Q.A.H.S. and College, Lawes, was organised and some 500 persons attended.

FAUNA AND FLORA CONSERVATION.

By the end of the marsupial skin year (December 31) 2,002 permits and licenses had been issued, and 361,462 kangaroo, wallaroo and wallaby skins were marketed. This represents increases respectively of 402 and 55,846 on the previous year's figures. The mapping of sanctuaries has been completed, and the publication of these maps will be of appreciable value to the public. The data on the survey of deer in Queensland are also approaching the publication stage. A long-term study of wild ducks, including a banding project, has been initiated.

During the year 15 honorary fauna protectors and one honorary native plants ranger were appointed. Six prosecutions for breaches of the Fauna Conservation Act of 1952 were recorded.

PLANT PATHOLOGY SECTION.

In southern Queensland the year under review was marked by a dry spring followed by one of the driest summers on record, which was in direct contrast to the exceptionally wet summer and autumn of 1956. Most of the commonly occurring air-borne diseases of field crops were rare or absent, but powdery mildew (*Erysiphe graminis*) was prominent on barley, canary grass and wheat.

Field trials were also affected by the dry conditions in that a low disease level made definite results difficult to obtain. For example, brown rot (*Sclerotinia fructicola*) of stone fruits was at no time serious, in contrast to the record outbreak of the previous season. Seed treatment experiments for the control of Rhizoctonia scab of potatoes, covered kernel smut of sorghum and head smut of maize each suffered from the poor development of the disease in question in spite of the provision of adequate initial inoculum.

In North Queensland the situation was different. An early commencement of the wet season in December led to an upsurge in activity of the major fungous pathogens. On the coast, banana leaf spot (*Cercospora musae*) and banana speckle became particularly active, while pink disease (*Corticium salmonicolor*) of citrus and white leaf spot (*Corynespora casiicola*) of papaw were troublesome. On the Atherton Tableland, rust and brown spot (*Physoderma maydis*) caused defoliation of maize crops.

CEREALS.

Despite drought conditions since planting, the soil-borne crown rot (*Fusarium graminearum*) of wheat caused appreciable damage and infection in field trials was satisfactory. In a fertilizer-trace element experiment no significant yield responses or differences in number of infected plants were obtained from soil applications of nitrogen, potash, superphosphate, zinc, boron, iron, copper, manganese and molybdenum. In a varietal susceptibility trial, where 20 varieties of wheat were grown on heavily infested soil, susceptibility followed the same general order as in the previous year. The lowest ratings for seedling death were made in Lawrence (7 per cent.) and the highest in Puseas and Ford (30 per cent.)

FIELD CROPS.

Cowpeas.

Almost 300 of a new batch of cowpea introductions supplied by the C.S.I.R.O. Plant Introduction Service have now been tested for resistance to stem rot (*Phytophthora* sp.). Some promising material has been retained for seed and will be further examined next season.

The resistance of C.P.I. 12153, Blackeye 5, Malabar, and C.P.I. 12148 has been demonstrated again this year at Kumbia. Progress has been made with incorporating resistance in the popular Poona variety and some promising material is being selected on an infested site in co-operation with the Agriculture Branch.

Peanuts.

It has been shown in replicated field trials that while the mercurial seed dressings are the most effective for the control of pre-emergence rot (*Rhizopus arrhizus*) of peanuts they are not so useful in the case of crown rot (*Aspergillus niger*) and under some circumstances may even increase the incidence of this disease. Some of the new non-mercurial seed dressings are showing more promise against crown rot and further trials with these alone and in combination with mercurials are now in progress.

Tobacco.

The past tobacco season was a bad one for blue mould in North Queensland. Many field plantings were handicapped from the beginning by infection with mould at the seedling stage due to careless methods of seedbed fumigation. Later in the season weather extremely favourable to blue mould development gave rise to epidemic outbreaks along the Burdekin in October and

in the Mareeba-Dimbulah areas early in November. Systemic stem infection following earlier leaf attack resulted in weak stalks which lodged badly during wind storms, causing some disastrous losses.

Field observations and spore trapping have shown that in North Queensland there is an abundance of blue mould spores available from such sources as infected overwintering volunteer plants and suckers to initiate seedbed and field infection in the new season. Some concerted action to eliminate this source of inoculum is desirable.

Two seedbed screening trials involving 18 different materials were conducted at Kamerunga and Parada. Considerable variation in effectiveness occurred and only a few showed sufficient promise to justify further investigation. Two of the best organic fungicides and one copper fungicide were then used in a field trial at Parada. Each of these controlled mould during the earlier stages of plant growth but the two organics were quite ineffective against a late epidemic and the copper, although better, proved phytotoxic. A preliminary attempt to control field mould by the use of a fogging and misting machine showed some promise and this work will be expanded during the coming season.

Further work with tobacco stem rot has proved the pathogenicity of a strain of *Rhizoctonia solani*. The opportunity was taken to test all the named tobacco varieties grown at Parada for their reaction to this organism.

SUBTROPICAL FRUITS.

Failure of some orchardists to obtain commercial control of black spot (*Guignardia citricarpa*) of citrus in the Charters Towers district prompted a spraying trial against this disease. Home-made cuprous oxide plus white oil proved reasonably effective in spite of the prevalence of black spot at the time. Bordeaux plus white oil and zineb plus white oil were definitely inferior.

A further attempt to control brown spot of the Emperor mandarin was made at Nambour during the 1955-56 season and the results are now available. Home-made cuprous oxide plus zinc sulphate was significantly better than zineb but still only reduced the disease by about 50 per cent. There was little difference between schedules embodying four and five sprayings.

TROPICAL FRUITS.

Pineapples.

The pineapple top rot (*Phytophthora cinnamomi*) experiment at the Maroochy Experiment Station has now been finalised and the results submitted for analysis. A pre-planting treatment with strong Bordeaux mixture (1-1-3) gave good control for eight weeks and exerted some effect for as long as six months. Four of the newer organic fungicides and a mercurial used at normal strengths were much less effective. The best of these will be tried again at higher concentration.

Bananas.

Banana leaf spot (*Cercospora musae*) control experiment No. 5 at Stoney Creek has now been completed. Bordeaux mixture (3-2-40) plus white oil plus malachite green has proved the outstanding fungicide for leaf spot control in a long series of experiments in which all other materials tried have shown only mediocre performance. The new spray has already been tried by several northern banana growers, who are enthusiastic about its use. Very effective control has been obtained at a time when unsprayed plantations in the same district have suffered serious losses.

Leaf spot experiment No. 6 was commenced in December. This was set out to ascertain the effect of substituting copper oxychloride and zineb for Bordeaux and to determine the relative importance of the oil and the malachite green. It appears that the main effect of the supplements is to slow up or even completely inhibit the development of the fungus within the leaf and thus reduce the number of early streaks passing to the destructive spot stage.

Following a preliminary trial a large-scale fogging and misting experiment employing oil-based fungicides was commenced in December. Treatments are being applied at weekly and fortnightly intervals. The results so far have been promising and in favour of weekly treatments. The use of a light misting machine may provide a practical means of carrying out leaf spot control on hilly plantations where the expense and difficulties involved in spraying by conventional methods are scarcely justified.

VEGETABLES.

Tomatoes.

In the glasshouse a preliminary assessment of the leaf shrivel reaction of 166 varieties and breeding lines was undertaken. About 20 of these are retained for future work. In the same connection, hybrid progeny of the cross *Lycopersicon esculentum* x *L. peruvianum* have been raised and tested in an attempt to carry the tolerance of the wild species into the cultivated tomato.

The Fusarium wilt work has been aimed at providing a stock of resistant material upon which field workers could draw if circumstances demanded greater resistance to this disease. A large range of varieties and hybrids have been tested in the glasshouse and under field conditions. An F1 hybrid, Burwood Prize x Manalucie, has performed well in North Queensland, where leaf mould (*Cladosporium fulvum*) resistance is also in its favour.

Beans.

Rust-resistant beans of the Brown Beauty type are now being made available in small quantities for exhaustive field testing before being officially released. This project, which was begun in 1951 with the cross Brown Beauty x California Small White, is now nearing completion. Some of the lines assessed during the year contain five back crosses to Brown Beauty in their make-up and should therefore have good prospects of successfully establishing themselves. In addition to rust resistance, some lines possess combined resistance to mosaic, anthracnose, angular leaf spot, halo blight and common bacterial blight.

SOIL MICROBIOLOGY.

The legume inoculum service increases considerably each year. Some 12,000 cultures were prepared in 1956. Local inoculum distribution centres are now firmly established at Warwick, Toowoomba and Gympie and have been enthusiastically received by dairy farmers and their organisations. These centres serve important pasture improvement areas in which many of the soils are devoid of suitable bacteria for the pasture legumes used, making inoculation essential for successful plant growth.

Experimental work has been confined to the tropical legumes, especially centro (*Centrosema pubescens*). Screening trials of overseas and local isolates have been carried out at the Coolum Field Station. These show the need for inoculating many of the tropical pasture legumes, some of which are very specific in their requirements.

The bacterial symbiotic system with centro is being examined from the aspects of differences in strain virulence, nodule type and the development of nodulation. The state of the nodules at various stages of plant growth is being plotted from field trials in northern and southern Queensland.

Some 60 strains of legume bacteria from tropical and temperate legumes have been subjected to a range of temperatures. With many of these, prolonged exposure to temperatures such as are sometimes experienced in tropical soils results in death of the bacteria. Indications of the field importance of this have been obtained.

CHEMICAL LABORATORY.

Mr. C. R. von Stieglitz, Agricultural Chemist.

The universal applicability of chemistry to the solution of scientific problems has perhaps never been so apparent as it is today. Few scientific investigations would be complete without the associated chemical facts needed for their elucidation.

It is obvious, therefore, that any expansion of the research activities of other Branches of the Department inevitably brings in its train additional work for the Chemical Branch, be it investigational or routine. To cope with the new and varied problems new techniques must be exploited, and these, however desirable they may ultimately prove to be, initially create fresh problems.

The following examples of modern approaches to problems, taken from the year's work of the three sections constituting the Branch, may be quoted:—(1) The use of radioactive isotopes in the solution of plant nutrition problems; (2) the employment of chromatography and spectrophotometry in the separation and analysis of organic compounds used in insecticides, pest destroyers, etc., and (3) the use of special physical equipment such as that used for electrophoresis in the study of wheat protein.

Once these new techniques are mastered a great saving in time is manifest, but such methods in their turn demand specialized and costly equipment and above all the qualified personnel to operate and maintain it.

The chief results of work undertaken during the year are given under the headings of the three sections constituting the Branch.

PLANT NUTRITION SECTION.

Major Plant Nutrient Studies.

Two co-operative studies with the production Branches were carried out during the year.

The first, in connection with urea applications to a wheat crop, was part of the wheat quality investigations. Urea was added to the soil and plant in different quantities and at different times during the growth of the plant. Periodical checks of the nitrate content of the soil from the control plots and from those which received the highest quantity of urea (2 cwt. per acre) were made throughout the season. The results showed that an increase in nitrates from 5 p.p.m. to 40 p.p.m. occurred in the 0-4 in. depth in those plots to which urea had been applied broadcast just prior to seeding. Applications of urea which were made by means of a spray to the plants at later periods had very little effect on soil nitrates until after rain had fallen towards the end of the experiment. Even then, the nitrate content of the soil at depths below 12 in. remained practically constant. A significant response to nitrogen, measured by the harvested yield of wheat grain, was obtained in this trial from both soil and spray treatments.

The second experiment was designed to study the movement of available nutrients following the usual small-crop practice of applying to tomatoes a basal dressing of a complete fertilizer mixture (5 : 13 : 5) at planting and a side dressing of the same mixture later when the plant begins to fruit. The soil used in this experiment was the red clay loam of the Redlands Experiment Station. Soil samples from the 0-1 in., 1-2 in., 2-3 in., 3-6 in., 6-9 in. and 9-12 in. layers were analysed for available plant food content. Samples taken one week after the basal fertilizer application revealed that the phosphorus and potassium components were concentrated in the 2-6 in. layer of soil and that nitrate nitrogen was fairly evenly distributed from 2 to 12 in.

Plants in the no-nitrogen plots initially showed foliar symptoms of nitrogen deficiency, but later, due to deeper root penetration the plants recovered and the leaves became a healthy colour. This observation correlated well with soil analytical figures, which showed a very low level of nitrates up to 9 in. in depth but high amounts at 9-12 in. Further analytical figures obtained a month after the fertilizer side dressing had been made suggest that the plant benefits from the nitrogen in the side dressing but not from phosphorus or potassium as these plant foods by contact with the soil become positionally unavailable. Crop yields showed no significant response to side dressings of any of the three plant foods.

Zinc Deficiency Studies.

Field Studies.—Mention was made in the last annual report of a nutritional disorder of linseed occurring on a black earth soil at Brookstead on the Darling Downs. This disorder was diagnosed in the field as zinc deficiency and tests of the phosphorus/zinc ratio in the leaves added confirmatory evidence. A field trial was therefore established at Brookstead during the year in co-operation with the Agriculture Branch, to observe the effects on linseed of an application of zinc sulphate to the soil. In addition, a pot trial was carried out in Brisbane to supply supplementary data. The results of the field trial may be summarised as follows:

Treatment.	Oven-Dry Weight of Plants at Flowering.	Dry Weight of Clean Seed.
	Oz.	Grams.
Control	36·4	97·0
Zinc sulphate 15 lb./acre..	39·5	108·0
Zinc sulphate 30 lb./acre..	40·0	92·1
Sulphur	37·6	95·7
Sulphur plus zinc sulphate 15 lb./acre ..	42·2	119·5
Sulphur plus zinc sulphate 30 lb./acre ..	39·1	114·3

Analysis of the yields from the individual plots showed no significant difference between the oven-dry plant weights, but for the weight of clean seed treatment with zinc sulphate at the rate of 15 lb. per acre was highly significant and that with sulphur at 1,200 lb. per acre (added to reduce the pH of the soil and so render the zinc more soluble) was significant at the 5 per cent. level. The amount of sulphur required to reduce the soil pH from 8.0 to 6.0 was computed from a buffer curve prepared in the laboratory.

Plants in all plots showed typical symptoms of zinc deficiency (death of growing tip, subsequent branching, bronzing and flecking of foliage) at a very young stage of growth and the crop had the characteristically uneven appearance associated with the disorder, with normal and affected plants occurring apparently at random over the area. This was also true of the adjacent commercial linseed plantings. Indications are that the physical state of the soil has an important bearing on the problem and this aspect will be checked next season.

A puzzling feature of the disorder is the influence of temperature. Cold weather affects the plants markedly and an appreciable improvement occurs with the warmer weather. Apparently the plant is able to utilize the zinc absorbed into its system much more readily at higher than at lower temperatures, as chemical investigations have established the fact that the quantity of "available" zinc extracted from the soil at temperatures ranging from 8 deg. to 36 deg. C. is practically constant.

"Available" Zinc in Soil.—Investigations of methods for estimating "available" zinc in the soil have yielded encouraging results to date. With one particular method, two soils known to respond to zinc applications in the field gave low values and one known not to be deficient gave relatively high values. Such a method, if proved successful, would be a useful diagnostic tool for determining zinc deficiency in soils.

Pot Experiments.—The pot experiments in connection with the zinc deficiency in linseed were designed to study the movement of phosphorus (by means of the radioactive isotope P32) in plants when grown in soil treated with zinc and phosphorus to give different

phosphorus/zinc ratios. Valuable experience was gained in the technique of obtaining radio-autographs and in measuring the radioactivity in the plants. It was established that phosphorus movement in the plants was very rapid, as it was possible to detect the presence of the P32 in the tip of the plants 24 hours after its application to the soil.

Tobacco Investigations.

The relationship between tobacco leaf chloride and soil chlorides was studied at Millaroo during the 1956-57 tobacco season by analyzing leaves at different periods during the growth of the crop and simultaneously determining the soil chlorides. The amounts of calcium, sodium, potassium and phosphorus in the leaves were also determined. The tobacco variety was Hicks and the soil type a loamy sand of the Elkin series. The following summarises the main results.

(1) The chloride content of the hills was slightly greater than that of the furrows in the 0-3 in. zone. The most significant increase occurred in December (the values then being hill 62 p.p.m. Cl, furrow 31 p.p.m. Cl). Below 12 in. no difference showed up and moisture remained good throughout the season.

(2) Leaf chloride showed little variation until the third pick when an appreciable increase occurred (1st pick 2.2 per cent. Cl, 3rd pick 3.4 per cent. Cl). The third pick coincided with the highest soil chloride figures.

(3) Calcium was highest in the lower leaves and increased with maturity.

(4) Sodium was generally low.

(5) Potassium maintained a high level throughout the season and did not vary greatly with plant position.

(6) Phosphorus was highest in the young leaves and showed an increase at all leaf positions with maturity.

Soil Survey Work.

Three reports were submitted during the year. Two of these were of detailed surveys in the Dimbulah-Mareeba area, one of 17,000 acres and the other of 6,000 acres; the third was of a reconnaissance of 22,500 acres of land near Theodore. In addition, a small area of land adjoining the Redlands Experiment Station was surveyed for the Horticulture Branch.

The soils of the first-mentioned area, known as "Left Bank Walsh," were placed in six groups as a guide for land use policy.

Group 1 soils have grown successfully crops of maize, peanuts, various legumes and citrus, as well as tobacco, so are considered suitable for perennial and annual crops. Group 2 soils are suitable for tobacco but are not considered satisfactory for crops such as maize and peanuts. These two groups constitute 12,260 acres. A further 1,190 acres could probably be used for tobacco but the soils are very sandy and overlie concretionary hardpans at about 4 ft. In the wet season they become waterlogged.

Group 4 soils are deep sands of unknown potential. Investigations on watering technique would be necessary before putting these soils into production as they would make a heavy demand on water supplies. To date they have not been in production but if the watering technique problem can be solved they could also grow tobacco and small crops.

The remaining groups, which account for an area of 2,760 acres, contain most unattractive soils. Some of them have drainage and salinity problems which must be solved before they could be cultivated; others are skeletal soils.

The second report deals with the Nullinga-Parada section. In this the same land use system for soils as used for the Left Bank Walsh was employed. Of the 6,000 acres mapped, only 720 were classified as being suitable for general agriculture, including tobacco. An additional 860 acres could probably be uesd for tobacco but experimental crops would first need to be grown and observed. Of the remaining soils, 520 acres would need special attention to drainage before use and 3,000 acres are skeletal soils having little, if any, agricultural potential.

The findings of the reconnaissance survey of "Wallaby" holding near Theodore indicate that a considerable portion of the soils on it would be suitable for agricultural crops. For land use and mapping purposes the soils were grouped into 10 categories. Those soils considered suitable for agriculture are mostly attractive self-mulching clays.

Routine Analyses.

Totals of 3,425 soil samples and 1,242 waters were analysed and reports submitted to those forwarding them. Of the soils, 948 were in connection with various investigation projects and 342 were analysed for the Bureau of Investigation Most of the remainder were sent in by field officers for fertility assessment. The most common deficiencies found were those of phosphorus and nitrogen.

Owing to the dry weather during and following the summer a larger number of waters than is normal has been received for report on suitability for irrigation or stock. Many unsuitable for both purposes have been received but it has been possible in many cases to suggest suitable dilutions of bad stock waters to enable their use in the present emergency.

Wallum Investigations at Coolum Field Station.

Climatic Conditions.—As moisture conditions at time of planting play such an important part in the establishment of both grasses and legumes on the sandy wallum country, it is of interest to record here the rainfall data since 1953, the year the experiments started.

TABLE 1.

RAINFALL (IN POINTS) RECORDED AT COOLUM FIELD STATION.

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
1953 ..	1,196	1,142	643	537	182	34	43	406	233	566	697	255	5,919
1954 ..	524	2,067	387	253	553	154	1,807	470	310	594	342	234	7,595
1955 ..	159	741	1,995	821	1,109	314	210	0	225	442	172	718	6,906
1956 ..	512	1,531	2,156	419	639	352	431	27	185	184	538	1,226	8,200
1957 ..	765	359	474	14	18	230	..	..	..	..	..	..	..

It will be seen that both annual and monthly totals have varied greatly between years.

Two cyclones were experienced in 1954, one in February and one in July, and another in March, 1955. For the January-June period the present year is the driest of those recorded.

The dry weather in the spring months of 1956 restricted plantings of summer grass species and reduced the yield of the pineapple crop but was beneficial in that it enabled certain lowlying portions of heath land to be cultivated. It also facilitated the maintenance work on drains. Some frost damage occurred to some of the summer grasses but para grass on the grazing area was unaffected.

Summer Grass Variety Trial.—Table 2 gives the yields and protein values for the different grasses in this variety trial, which was planted in 1953.

TABLE 2.

1953 Summer Pasture Variety Trial.

Grass Species.	Summer Yields (cwt./ac.)*				Protein Percentage (Mean)† 1956–57 Harvest.	
	1953–54.	1954–55.	1955–56.	1956–57.	Grass.	Legume.
Paspalum	40·1	48·4	31·7	30·3	8·09	19·46
Green panic	88·6	86·3	60·1	40·9	7·53	17·56
Rhodes	61·1	64·5	56·0	39·6	7·01	17·75
Para	96·7	132·4	35·9	31·1	8·46	19·23
Kikuyu	26·9	32·8	17·7	35·0	8·54	19·05

* Green weights.

† Moisture-free material.

Note: With the exception of the 1953-4 harvests, kikuyu has been given additional nitrogenous fertilizer. In addition to the grasses all the plots contain either or both of the legumes centro and lucerne.

Para grass, which yielded exceptionally well in the first and second year, was badly in need of renovation in the third year and the subsequent drop in yields cannot be regarded as typical of normal field performance. The legume centro, which was difficult to establish initially on these plots, has now spread well on some and appears to be making a substantial contribution to the soil nitrogen, as evidenced by the colour of the grass with which it is associated.

In a subsequent trial comparing *Paspalum secans* and *Cenchrus ciliaris* (commercial buffel) with green panic, paspalum and Rhodes grass, *P. secans* outyielded the others. However, it is a coarse grass and its grazing potentialities are unknown as yet. Although the commercial buffel grass did not do well in this trial, Biloela buffel has shown great promise at Coolum. Plate 1 shows a field of Biloela buffel planted on Jan. 25, 1957, the photograph being taken on Apr. 12.

Molasses Grass.—A fertilizer trial with molasses grass has shown that this grass does well on drained heath country and will stand up to highly acid conditions. The soil at the trial site had a reaction value of pH 4.8 and it has been shown that no significant difference in yield was obtained through the application of lime. The amount of superphosphate required for optimum growth lies between 3 and 6 cwt. per acre. A grazing area of two acres of this grass has now been established on heath country and in portion of it a good stand of the legume *Stylosanthes gracilis* (stylo) has been obtained.

Plate 1.—Biloela Buffel Grass Four Months After Sowing on Heath Country at Coolum.

Minor Pasture Plantings.—Many small plots of mixtures of grasses and legumes have been planted for comparison. Of this year's plantings, promising results have been obtained with mixtures of *Andropogon* sp. (C.P.I. 15836) and tropical kudzu (*Pueraria phaseoloides*), and *Pennisetum* sp. (C.P.I. 8328) and kudzu. The former mixture is illustrated in Plate 2.

Para Grass Cultivation Trial.—Experience at Coolum has shown that para grass established on well-drained heath suffers from lack of water during dry periods owing to its shallow rooting habit. An experiment was therefore initiated in which the grass was planted in rows which constituted the subsidiary drains linking up with the main system. The area was oversown with red and white clovers in the hope that the clovers might establish on the higher ground in the interspaces. Unfortunately, the dry summer did not provide suitable conditions for the trial, and whilst the para has done well in the moist furrows the only clovers to survive have also been in the furrows, where normally they would have become waterlogged.

Pineapple Trials.—Although a very dry period was experienced at the time of flowering the yields of pineapples for the plant crops and for one ratoon were above the average for the district, and on present observations, after four harvests of successful plantings since spring 1953, there seems no reason why pineapples should not be grown successfully and economically on the banksia sands.

Plate 2.—A Promising Pasture Mixture at Coolum—Andropogon **sp. and Tropical Kudzu.**

A trace element trial with pineapples to test the effects on yield of applications of copper and zinc was planted during the spring of 1956. This will not be harvested until the 1958 summer. No beneficial effects of the trace elements can be observed at this juncture, although copper and zinc deficiencies are known to occur in this type of country.

Miscellaneous Plantings.—Small plantings of bananas and citrus have been made on the forest-type country and both crops are doing satisfactorily to date. Bananas on deep sands (banksia country) have not been successful.

GENERAL ANALYTICAL SECTION.

A total of 1,603 samples was analysed by the section during the year. These included 1,195 grasses and fodders, 251 stock foods, 62 fertilizers, 87 veterinary medicines and pesticides and 8 oilseeds. Most of the grasses and fodders were submitted in connection with experiments being conducted by the Agriculture and Regional Experiment Stations Branches. Protein analyses, and in some cases calcium and phosphorus, were required. The remainder (293) were from experiments being conducted by a fertilizer manufacturer; analyses of the samples for protein showed that increases up to 2 per cent. on a dry-matter basis were obtained from the use of a nitrogenous fetilizer.

Fertilizers and Stock Foods.

Samples of fertilizers submitted by the Standards Branch to test their compliance with the Agricultural Requirements Act have in general been of good quality, but a number of stock foods were found to be below guarantee in protein and in several instances in vitamin A. Following the initial survey further investigation indicated that bad mixing was the cause of the trouble with regard to vitamin A.

Much of the time of the Senior Chemist and his chief assistant was occupied in investigating methods of analysing the numerous new formulations for pesticides and insecticides which are now on the market. Advances in chemical synthesis in recent years have been so great that the market has been flooded with new products. No sooner have analytical methods been devised for the assessment of one set of formulations than new ones appear on the market. Fortunately, new methods of attack are constantly being described in the literature and every advantage has been taken to exploit the relatively new analytical aids provided by chromotography and spectrophotometry in the solution of the various problems.

Of the pest destroyers and veterinary medicines which were examined, only two pest destroyers and one medicine were found to be below standard. The pest destroyers were a DDT formulation and a mixed dust. The former was a super-saturated solution which deposited DDT on cooling and the latter a dust which proved to be below the guarantee in both copper and sulphur.

The eight seeds examined for oil were those from a variety trial of linseed at Kingaroy. An appreciable variation in oil content occurs with variety, as shown below:—

Variety.	Oil (Ether Extraction).
	Per cent.
Morocco 5085	37·1
Plate Q.2916	37·5
Walsh-Meggitts Selection	37·6
Walsh	38·8
Lona Buenos Aires Q.2915	39·8
Calar	40·0
Malabrigo C.S.I.R.O.	40·4
Uruguay Q.2917	41·8

CEREAL SECTION.

The following summarises the information on wheat samples examined by the Cereal Section during the year.

Sender.	Description.	Number of Samples.
Cereals Advisory Committee	Stubble burning experiment	6
Agriculture Branch	(*a*) Plant breeders' samples	68
	(*b*) Samples from field experiments of various types	112
Farmer		1
Regional Experiment Stations	Field experiments of various kinds	123
Royal Agricultural Society (Toowoomba)	Wheat quality competition	132
Wheat Board	Protein survey	48
	Total	490

Of the 490 samples examined, 193 were submitted for complete quality tests (i.e., moisture, protein, phosphorus, milling, physical and baking tests).

Miscellaneous Work.

Six moisture meters were calibrated for farmers. Co-operative research work with other laboratories in connection with the standardization of physical testing equipment and analytical methods for wheat quality assessment was undertaken.

Exhibits on cereal quality which created considerable interest were prepared for the Brisbane and Toowoomba Shows.

Co-operative Fertilizer Trials.

The results of two joint projects with the Regional Experiment Stations Branch are of interest. The first dealt with wheat from a superphosphate trial and the second with a rotational experiment in which wheat followed various grain crops. Thirty-six samples of wheat were analysed for nitrogen and phosphorus in connection with the first trial; these showed that the protein content was 0.3 per cent. higher in the treated plots but that the phosphorus content was not affected. In the second experiment, protein and phosphorus figures were high in all instances, the protein varying from 13.9 to 14.5 per cent.

Wheat Competition.

Ninety-eight samples were entered in a competition for the best bushel of wheat staged at the Toowoomba Show. Of these, 34 were milled and tested on the machines and 12 were selected for baking tests. The winning sample, one of Spica, was of excellent quality and not inferior to the best Canadian wheat. The protein content was 13.9 per cent. It had been grown on black earth soil following lucerne. The average protein content of wheats received in connection with the contest was 11.7 per cent., which is 1.2 per cent. lower than in the previous year.

DIVISION OF ANIMAL INDUSTRY: BRANCH REPORTS.

VETERINARY SERVICES BRANCH.

Mr. C. R. Mulhearn, Director of Veterinary Services.

Seasonal conditions at the beginning and the close of the year presented a direct contrast. Following heavy winter rains in most areas, with considerable flooding in the south-west and central-west, well-spaced spring rains and warm temperatures, except in the Eastern Downs, where late frosts were experienced, gave the season an excellent start. Summer rains were patchy and, except in the northern areas, inadequate. This, allied to generally high temperatures extending until the middle of May, rendered conditions extremely difficult.

Although it would be incorrect to say that the State is drought-stricken, it can safely be said that with the possible exception of parts of the Burnett spring rains are of crucial importance. If they eventuate, the whole State, with the exception of the northern areas, will have had a very hard winter. If they fail, heavy stock losses will occur.

Late winter rains would have no immediate beneficial effect and would increase stock hardships. If they are sufficient to maintain moisture in the ground during the warmer spring months, a good growth of feed will come away. In most areas water supplies are adequate until late in the year. Stock routes are generally in fair to good condition. As an additional hazard, many properties, especially in the central districts, are heavily overstocked, and disposal of stores and obtaining of agistment country is becoming very difficult.

Districts which depend upon winter crops, such as the Eastern Downs, have been hard hit by the lack of planting and follow-up rains. Dairy production for 1956-57 has fallen considerably.

The turn-over of fat cattle during the year was above average, and supplies are still adequate.

STAFF AND ADMINISTRATION.

During the year a new position of Divisional Veterinary Officer, Roma, was created to administer the Roma and Charleville stock districts. One Veterinary Officer and one Assistant Veterinary Officer resigned and one Assistant Veterinary Officer was seconded for post-graduate work. Two Assistant Veterinary Officers were appointed.

New District Inspector positions at Goondiwindi and Mt. Isa were filled. One District Inspector has been absent on sick leave for six months. A position of Special Stock Officer was created and filled. One Inspector resigned, one retired and five new appointments were made. Some temporary staff has been appointed.

Financial considerations forced a restriction of mileage and acquisition of new vehicles. This reduced the services which the Branch could render, but by due economy it has been possible to return to full services.

STOCK MOVEMENTS.

Stock routes generally remained in good order throughout the year and movements of stores from the Gulf and Peninsula areas were above average. Transfers from the Northern Territory were maintained at normal levels.

One northern meatworks commenced operations late in March and the remainder in the middle of April. Supplies of fat cattle to works last season were adequate and should be maintained to northern works this season.

The flow of Queensland cattle to the Philippines for slaughter has been further increased and approximately 10,000 were exported there for this purpose. These cattle are of average quality and consist mainly of the older, large bullock, which is not favoured in this State. Several shipments have been of aged cows. Two new cattle boats have been put on the run.

In addition, some 500 beef breeders and 200 dairy cattle have been moved to New Guinea. Difficulties were experienced with sea transport and many of the dairy stock and some of the young beef animals have been transported by air. Stud cattle were exported to all States of the Commonwealth. A Bristol Freighter aircraft was used for one transfer.

Interstate stock movements are shown in Table 1.

TABLE 1.

INTERSTATE STOCK MOVEMENTS, 1956–57.

——	Cattle.	Sheep.	Pigs.	Others.
Entered from Nthn. Territory	95,115	..	..	..
Entered from New South Wales	22,935	231,639	1,913	713
Removed to Northern Territory	3,766	..	..	..
Removed to New South Wales	339,034	448,349	52,291	1,071

CATTLE DISEASES.

Tuberculosis.

One new contract for tuberculin testing was allotted and one contract allowed to lapse, the area concerned being re-allocated to neighbouring zones. Two practitioners relinquished contracts; one has been filled and one is being handled temporarily by Departmental Officers. There are now 44 Approved Veterinary Surgeons in the Tuberculin Testing Scheme.

There has been little change in the number of cattle under test, and 509,850 tests were carried out. Although approximately the same number of tests have been carried out, the number of reactors has been reduced to half those of 1955-56.

TABLE 2.

TUBERCULIN TESTING, APPROVED SCHEME, 1956-57.

Division.	No. of Herds	Cattle Tested.	No. of Reactors.	Percentage of Reactors.
Brisbane Division—				
Southport-South	93	6,365	40	0·63
Coomera-Southport ..	185	15,282	19	0·12
Beenleigh-North	98	3,096	9	0·29
North Brisbane and Petrie	143	8,348	27	0·32
Moggill-Kenmore	35	1,436	5	0·35
Samford	29	1,448	5	0·35
Beenleigh-Beaudesert ..	167	11,249	20	0·18
Beaudesert-Border ..	122	15,562	321	2·06
Dayboro	74	5,991	37	0·62
Dayboro-Mount Mee ..	5	485	..	..
Woodford	80	7,238	38	0·53
Caboolture	44	2,330	23	0·99
Southern Ipswich	275	13,206	28	0·21
Chambers Flat	27	559	24	4·29
Maroochy Shire	191	11,813	51	0·43
North Ipswich	330	13,998	29	0·21
Boonah	237	11,784	46	0·39
Maleny-Landsborough ..	480	32,349	35	0·11
Esk	263	18,323	64	0·35
Laidley-Lowood	349	14,998	87	0·58
Division Totals ..	3,227	195,860	908	0·46
Cairns Division	334	19,980	3	0·02
Townsville Division	29	2,252	10	0·44
Rockhampton Division ..	144	10,972	33	0·30
Burnett Division	2,531	172,491	231	0·13
Toowoomba Division	1,948	108,295	73	0·07
Brisbane Division	3,227	195,860	908	0·46
Grand Totals ..	8,213	509,850	1,258	0·25

In general, testing by Departmental officers is restricted to warm milk supply herds, certified herds and infected herds outside gazetted areas.

The problem of tuberculosis in beef herds has been under consideration for some time and the practice of voluntary testing on heavily infected properties has been continued and extended. Surveys of tuberculosis condemnations at meatworks are continuing.

Details of testing by Departmental officers are given in Table 3.

TABLE 3.

TUBERCULIN TESTING BY DEPARTMENTAL OFFICERS.

—	No. of Herds.	No. of Animals.	Reactors.	Percentage of Reactors.
Dairy ..	63	3,229	39	1.3
Beef ..	19	9,769	257	2.5

Bovine Pleuropneumonia.

Nine properties were quarantined and six released during the year. In several cases the original diagnosis was based upon examination of carcases sent in for slaughter and traced back to an outbreak on the property of origin. Only one minor outbreak occurred outside the enzootic area and this was associated with introduced cattle. One travelling mob from a property in the enzootic area was quarantined. Ten serious occurrences in fat cattle consigned to meatworks from the south-west were detected on slaughter. These cattle gave very little indication of infection prior to arrival in Brisbane.

Extension activities utilising the services of four experienced officers full-time were maintained during the season. These officers visited 355 properties in enzootic areas advising on methods of control and evaluating progress already made. More than two-thirds of these properties had been visited previously and improvement in disease control was noted on the majority. The results obtained have justified continuation of the method.

The metal portable crush which was developed in the course of this work is now being fabricated commercially.

Vaccination within the previous six months of all store cattle orginating from or passing through defined enzootic areas is obligatory. Vaccination of fat cattle which will be on the road for more than 28 days is also insisted upon, as it has been shown that extensive outbreaks may occur in such cattle.

Associated with meatworks inspection a comprehensive series of coloured slides has been prepared, showing a graduated series of lesions from clinically affected cases down to minor adhesions. These slides have proved of considerable value in demonstrating the variety of lesions due to this disease which may be encountered in meatworks inspections. A series of observations was made upon the occurrence of sequestra. It is hoped by this means to develop a uniform method of recording lesions. A film showing pleuropneumonia and its control under Queensland conditions was compiled and released for extension purposes.

Correlation of lesions found on slaughter and extension work on the property of origin was continued.

Abortion and Sterility.

More than 50,000 calves were inoculated with Strain 19 vaccine against brucellosis. This represents a gratifying increase of nearly 50 per cent. on previous years. The results of vaccination have been generally extremely satisfactory and no breakdowns have been reported. Several deaths occurred from what was apparently anaphylactic shock.

Fuller understanding of the causes of abortion and sterility operating in the State has assisted in the evaluation of the role of brucellosis. Strain 19 has not been used sufficiently extensively to stamp out this disease, especially in milk supply herds where there is a heavy turnover of cattle and no calves are raised.

Vibriosis.—In addition to normal work on diagnosis and treatment in herds with a sterility problem, survey work in apparently normal herds by means of the mucus agglutination test has shown that widespread infection with vibriosis may occur without serious reflection in the fertility rate. Further investigation of the breeding history of these herds is required.

Field evaluation of methods of treatment has been continued. Wherever possible, 3-4 months' sexual rest is advocated, but it presents practical difficulties. Conception is generally facilitated by intrauterine treatments (usually 1 gram streptomycin plus 300,000 units penicillin), but a disturbing number of cows so treated return in 3-4 months. Regular examination of a number of treated herds to check on what happens in these cases is projected. Treatment of bulls is also under examination.

As far as possible, diagnostic work is carried out by Departmental officers and treatment referred to appropriate practitioners.

Leptospirosis.—The number of acute cases of leptospirosis in calves has been lower than usual, but abortion storms associated with high blood agglutination titres to *Leptospira pomona* and *L. mitis* have increased.

The syndrome previously described, in which bovine abortion not associated with sterility is noted in conjunction with positive leptospira agglutination titres, has been reported in considerable numbers from all dairying districts. *L. hyos* appears to be the causal organism in some 25 per cent. of such cases, the remainder being *L. pomona.*

Vaccination of cows and pigs with an *L. pomona* killed vaccine has been carried out as a field trial, but in the absence of effective challenge, results must take some time to evaluate.

Leptospira have been recovered from the urine of aborting cows. Only degenerated forms have been recovered from foetuses and in no cases has culture been possible.

Trichomoniasis.—No positive determinations of trichomoniasis were made although careful search was made in several herds in which some suspicion had been raised on clinical grounds.

Tick Fever.

As has been noted previously, ticks invaded large areas of previously clean country along the margins of ticky areas without the concomitant occurrence of tick fever. However, two severe mortalities did occur on previously clean properties. The majority of cases were in marginal areas, where there is a steady seasonal fluctuation in tick incidence, or in tick-infested areas.

A severe mortality in previously inoculated cattle occurred near Cloncurry. The organism incriminated in this case was *Babesia bigemina;* this is unusual, most cases in Queensland being due to *B. argentina.*

Few cases of anaplasmosis due to *A. marginale* were reported, although some evidence was adduced to indicate that the organism may be enzootic around Mt. Perry.

Neonatal Mortalities.

Neonatal deaths in calves recurred in the period October-January, the syndrome being identical with that reported last year. It was more severe in the Toowoomba area than last year and isolated cases continued into February.

Several outbreaks occurred in the absence of species of *Erigeron.* As these weeds are of almost universal distribution, their absence from one or two affected properties practically frees these plants from suspicion.

In view of the observed disturbance of blood clotting time in affected calves, the hypothesis that the syndrome might be due to an anticoagulant factor of vegetable origin, analagous to the dicoumarin syndrome, was investigated.

In a series of 57 cows calving on four properties, injections of vitamin K were made prophylactically on 11 cows. All these treated cows had normal calves, whereas of 46 untreated cows, 20 had calves which ultimately lived and 26 had non-viable calves. Four of the living calves from the controls were badly affected but lived following vitamin K therapy. Unfortunately, the results must be treated with some reserve, as treatment was instituted late in the outbreak when many cows were dropping normal calves. It is, however, indicative that further work should be instituted if the disease recurs.

Ephemeral Fever.

Scattered reports of the disease were received but their authenticity was doubtful; no epizootic occurred. Three relatively serious outbreaks with symptoms consistent with ephemeral fever occurred in travelling stock in the Collinsville, Rockhampton and Hughenden districts. They were characterised by high morbidity, serious disability and some deaths. Although supplies of a new drug were on hand, there was no opportunity to test its efficiency.

Johnes Disease.

One case of suspected Johnes disease occurred near Cloncurry in a bull which had been imported from an infected property in New South Wales. This bull was destroyed *in extremis* and clinical and bacteriological examination was extremely suggestive of Johnes disease. We were not able to confirm the diagnosis by isolation of the organism. By courtesy of the Veterinary Research Institute, Melbourne, blood samples of in-contact animals were submitted to the complement fixation restrictions were imposed on portion of the property test and two suspicious reactors obtained. Quarantine involved. All other animals imported from the suspect New South Wales property have been kept under surveillance but no other clinical cases were observed.

Miscellaneous.

St. George Disease.—Only isolated cases of this trouble occurred and conditions were unsuitable for widespread outbreaks.

Heat Stroke.—A severe mortality during an excessively hot period occurred in cows and bullocks awaiting slaughter at Cannon Hill. A total of 143 animals died in approximately 24 hours. These cattle had been trucked some 500 miles and held in yards for four days under maximum temperatures reaching 96 deg. F. and high humidity. *Salmonella bovis-morbificans* and *S. derby* were recovered from heart and lung specimens. It is considered that the presence of these organisms was an accessory factor in the high death rate. Measures to reduce the death rate from heat stroke at the metropolitan sale yards have been instituted. Losses from heat stroke occurred at country centres.

Warts.—This complaint was prevalent, especially in the central districts, and some losses were reported. A proprietary injectable bismuth salt was submitted to controlled trials but did not effect any improvement.

Coast Disease.—The incidence of this disease was relatively severe, particularly from November to February. Heavy losses were sustained by individual farmers. A toxin obtained from intestinal filtrates in three different outbreaks caused the death of laboratory animals and calves in relatively small doses. This toxin was neutralised by *Clostridium botulinum* antitoxin. It appears that the disease may be a rather unusual manifestation of botulinus intoxication. A number of herds have been inoculated with botulinus toxoid as a control measure and the future incidence of coast disease in these herds will be recorded.

Paresis.—A condition of unknown etiology occurred mainly in calves and heifers in the Ipswich district. Although the symptoms are somewhat similar to those observed in coast disease, perivascular cuffing in the brain has not been demonstrated in the latter disease.

Footrot.—Outbreaks of footrot in travelling mobs are not uncommon. Good results were obtained with sulphadimidine in spite of the practical difficulties of treatment.

Melioidosis.—The causal organism was recovered from the spleen of a bovine near Townsville.

Mastitis.—Staphylococcal mastitis is the most commonly reported type. Penicillin treatment is so widespread that few uncomplicated streptococcal cases are reported. No single line of treatment has been found uniformly successful against staphylococcal types, although most organisms isolated are susceptible, *in vitro*, to antibiotics, including penicillin. Treatment is based essentially on hygiene, good milking management, care of milking machines and lastly antibiotic treatment. A number of outbreaks were apparently due to *Klebsiella* and one to *Streptococcus zooepidemicus*.

PIG DISEASES.

Salmonellosis and pasteurellosis were prevalent. Glassers disease was reasonably common. Erysipelas showed considerable reduction on previous years. Posterior paresis was fairly common.

Footrot has been shown to respond to penicillin therapy. Spirochaetes and fusiforms were isolated from lesions.

Melioidosis occurs in a number of piggeries in the Townsville area. The strain usually appears to be of low pathogenicity and affects mainly young pigs; deaths are uncommon. Diagnosis is usually based on recovery of the organism.

Sparganosis was recorded several times from feral pigs on the western Darling Downs and is fairly common in pigs from northern areas which have been captured as suckers or have access to swamps.

SHEEP DISEASES.

Conditions throughout 1956 were conducive to development of footrot. One small outbreak involved rams recently imported from New South Wales. No cases were reported in local sheep. Affected sheep were treated and isolated. Foot abscesses were extremely common but improved with drier conditions. In some cases up to 10 per cent. of flocks were affected.

Some minor losses followed dipping off-shears. Post-dipping lameness occurred in some cases.

Hypocalcaemia was not very common. In several cases hypocalcaemia appeared to precede and complicate an attack of pregnancy toxaemia. ACTH was not found to be satisfactory in the treatment of advanced pregnancy toxaemia. Response to glucose or glycerin is obtained in the early stages.

Outbreaks of humpyback were observed throughout the summer and early autumn. *Solanum esuriale* was being eaten by sheep in all outbreaks.

Urinary calculi were responsible for sporadic losses. Lack of exercise appeared to be a factor in the case of some stud rams.

POULTRY DISEASES.

Sporadic outbreaks of infectious laryngo-tracheitis occurred and some 11,000 birds were vaccinated, mainly with mixed fowl pox-I.L.T. vaccine by the feather follicle route.

Favourable results were obtained in an attempt to eradicate chronic respiratory disease in a hatchery. An infected breeding flock was treated with streptomycin subcutaneously and eggs for hatching collected for a limited period. Chickens hatched from these eggs were raised in isolation and no cases of C.R.D. were detected in them during the observation period of nearly 12 months.

"Crazy chick" disease, bluecomb, chick nephritis, fowl cholera, and epidemic tremor in fowls, and blackhead and hexamitiasis in turkeys, were reported. Fowl pox, coccidiosis, leucosis, round-worm infestation and spirochoetosis were commonly encountered.

Gizzard erosion was reported in Cairns and Brisbane. The cause is unknown but there is some evidence that the trouble is of nutritional origin. Staphylococcosis occurred in fowls at Toowoomba.

HORSE DISEASES.

Severe losses of horses from Birdsville disease occurred on properties around Cloncurry, Mt. Isa and Urandangie from August to November. In some cases losses were sufficiently heavy to interfere seriously with cattle mustering. The outbreak was associated with unusually good winter and spring rains which maintained the heavy growth of *Indigophera enneaphylla* throughout the year. It was necessary on some properties to move horses to fresh country or to hand feed. Losses from this disease occurred at Stonehenge and Kynuna in April.

No clinical cases of change-hoof disease (suspected selenium poisoning) were reported from the Peninsula during the season, but specimens of *Morinda reticulata* forwarded from Bamaga showed as much as 1,400 p.p.m. selenium. Supplies of leaf were forwarded to the Animal Health Station, Oonoonba, for feeding trials.

Similar symptoms were reported in horses north of Richmond, where four horses were lost following sloughing of hooves and tail hair. Appreciable amounts of selenium were detected in hoof material, in species of *Sesbania* and in *Neptunia gracilis* (native sensitive plant) from the affected area.

Strangles was prevalent in the central-west during the late summer and occurred sporadically in the south-west. Vaccination conferred a reasonable degree of protection.

EXTERNAL PARASITES.

Cattle Tick.

Some further extensions of tick-infested country occurred during the year. Most of these occurred along the boundaries of infested areas, the most extensive being in the Upper Warrego, along the Carnarvon Range, probably due to return of cattle after musters in unfenced country. Extensions also occurred in cattle country below Alpha. Two outbreaks occurred well into clean country in the Blackall and Jackson areas. A total of 71 holdings was released from quarantine, and restrictions were imposed on 38 holdings because of fresh outbreaks.

The policy of maintaining strategic dips along stock routes was continued. These are mainly charged with DDT, but two vats are now charged with toxaphene and one with BHC. Charging of a strategic dip on the stock route below Alpha and a strategic spray race at Laura is in hand. In view of the shortage of skilled labour available for station work, steel prefabricated dipping vats are being constructed by several firms and a number of these are being installed. Availability of these vats greatly simplifies the provision of dipping facilities in freshly infested and marginal areas.

A survey of all dipping vats and medicaments used in them is being made for statistical purposes. Although the returns have not yet been analysed, it is apparent that the majority of Queensland dips are still charged with arsenic.

Observations on the Cooper spray race have been made. Several of these plants have been installed by graziers for control of ticks and to give preliminary treatments prior to the final dippings at clearing points.

Two new DDT formulations are being investigated; both appear to give satisfactory results. These preparations are relatively stable in suspension and have the added advantage that they can be used satisfactorily in hard or saline waters.

Spraying trials with organic phosphates are being carried on and satisfactory control is being obtained. Residual effects are very low. Reports of resistance to these substances are being investigated.

Aldrin dip formulations have been shown to be toxic, in one case to adult stock. Reports of toxicity from BHC, dieldrin, toxaphene and parathion have been received. No deaths associated with the use of the phosphoric acid esters recommended for tick control have been reported. Deaths have followed the use of parathion, which is formulated as a plant spray only.

Buffalo Fly.

Following its southerly extension below Chinchilla on the Darling Downs and Maryborough on the coast during the summer of 1955-56, the buffalo fly retreated during the winter and has been much more restricted this year. The extreme southern limits were Eidsvold and the Burrum River. There is considerable evidence to suggest that the fly can winter in sheltered areas between Bundaberg and Maryborough in favourable years. Normal fly control methods by means of DDT sprays are being maintained.

Sheep Blowfly.

No major blowfly wave occurred, due to the efficacy of control measures, especially the use of new insecticides. A tendency to neglect such routine operations as mulesing in favour of complete chemical control is to be deplored.

Lice.

Sheep lice are of major economic importance to the wool industry. Inspection of travelling sheep, with compulsory dipping of infected mobs, is resulting in considerable reduction of infestation. Using an insecticide such as aldrin, backline jetting appears to give reasonable control, but the method is not sufficiently reliable for travelling sheep, where complete eradication is necessary. Results depend greatly on the efficiency with which the method is carried out.

Stickfast Flea.

New infestations were reported from Cribb Island, Chinchilla, Jandowae and Barcaldine. Treatment of poultry, dogs and cats with DDT is undertaken in infested areas and movement of these animals controlled. Appearance of the flea in several holiday resorts has rendered control of casual movements, particularly of dogs, difficult.

INTERNAL PARASITES.

Haemonchus placei is economically the most serious parasite of calves. Lungworms and hookworms are responsible for heavy losses but are not prevalent. Calves which have built up a heavy burden during the summer are going into winter on a steeply falling plane of nutrition and heavy losses can be expected.

Liver fluke (*Fasciola hepatica*) was reported in cattle from Manumbar but no host snails could be found.

Haemonchus contortus spread widely in sheep flocks in the Diamantina, Thomson and Barcoo River systems during the summer. Acute haemonchosis occurred until the end of January, but loss of production through chronic infestations has since been more serious economically. Considerable attention has been given to advising graziers on control measures, particularly management practices. The use of fireploughs to break up swards and prevent local overgrazing has been favourably noted. Strategic drenching and the use of the oesophageal tube have been emphasised.

Oesophagostomum is a serious problem in sheep on so-called "desert" country of Central Queensland, and severe losses have occurred in weaners. Some outbreaks have been complicated by heavy tapeworm burdens. *Trichostrongylus* spp. have been observed in the central-west and northern districts. These parasites are only serious in these areas in unusually wet winters. Lungworms were recorded from Wallumbilla.

The only internal parasites of pigs of economic importance in Queensland are *Ascaris* and *Stephanurus*.

Hookworm infestation was extremely serious in working dogs in central and south-western Queensland. Piperazine was found effective in some cases but deaths are sometimes so sudden that treatment is useless.

The gizzard worm (*Acuaria* spp.) and eyeworm (*Oxyspirura* spp.) were prevalent in small poultry establishments in the far north. Piperazine has been used extensively in the control of intestinal and caecal roundworms.

POISONING.

Arsenical poisoning was again responsible for most of the recorded deaths from poisoning. Deaths at Ravenswood occurred from ingestion of soil and water from the site of an old poison shed. Twenty-five head were maliciously poisoned at Blackbutt. Deaths due to ingestion of lead, nitrites, carbon tetrachloride, DDT (fowls), nicotine sulphate, selenium and organic insecticides occurred.

Losses were recorded following ingestion of *Xanthium pungens, Lantana* spp., *Trema aspera* var. *viridis, Pratia concolor, Verbesina encelioides, Gastrolobium* spp., *Pteridium aquilinum, Xanthorrhoea* spp., *Cestrum parqui, Terminalia oblongata, Nicotiana* spp., and *Thevetia peruviana.*

Trachymene glaucifolia was suspected of causing inco-ordination, rapid exhaustion and sudden death in young sheep at Wyandra, but feeding trials were negative. Other plants which came under suspicion were *Ranunculus undosus* and cocky apple (*Careya australis*).

Although overall losses from poison plants were lower than normal, losses from cyanogenetic plants, mainly sorghums, were rather higher.

Because of the abundance of other feed. only light losses due to *Acacia georgina* occurred in 1956, but with the present promise of heavy podding and expected scarcity of feed in 1957, heavy losses later in the year are expected.

BREACHES OF ACTS.

Action under the Acts administered by the Branch is dictated by the best interests of the industry and the consumer. Ready co-operation is usually extended by stock-owners when restrictions are explained to them. Legal action is sometimes necessary where persuasion fails. There were seven prosecutions under the Stock Acts, mainly for travelling stock without permission of an Inspector; all were successful. Nine prosecutions were successfully undertaken under the Slaughtering Act. These mainly involved slaughtering on unlicensed or substandard premises.

One prosecution under the Brands Act in respect of illegal earmarking of sheep was undertaken and a conviction obtained.

EXTENSION SERVICES.

Field days and evening meetings, including the showing of appropriate films, were held in all Divisions. A great increase in material dealing with disease control released by field officers for publication in local newspapers was noted. Regional broadcasting studios are increasing their use of short topical talks by local officers, who are known personally to most of the listeners.

A film on contagious pleuropneumonia was completed and released for circulation.

NEW LEGISLATION.

New regulations dealing with the control of boarding kennels for domestic animals and minor matters in regard to meat grading were promulgated. The Bundaberg abattoir was brought within the ambit of the grading regulations and stock treatment charges altered.

SLAUGHTERING.

Details of slaughterings appear in Table 4.

TABLE 4.

STOCK SLAUGHTERED FOR LOCAL CONSUMPTION, 1956–57.

—	Bullocks.	Cows.	Calves.	Sheep.	Swine.
City of Brisbane (Abattoir)	72,531	64,603	91,154	519,718	56,460
Bacon Factories (excluding export)	7,771	74,786	69,206	11,907	265,434
Larger Population Centres	104,896	106,602	139,668	287,573	63,619
Country Centres	41,602	33,913	27,694	114,640	16,039
Totals	226,800	279,904	327,722	933,838	401,552

Grading of meat for local consumption in Brisbane, Toowoomba and Bundaberg is performed under the supervision of this Department. Continued efforts have been made to improve the stamps and meat-marking inks used.

The Bundaberg local abattoir commenced operations and will kill all stock for local consumption in that area, Townsville local abattoir is nearing completion and preliminary steps have been made for the construction of the Ipswich local abattoir.

A pathological and diagnostic service in connection with meat inspection will be established in a laboratory being set up at the Brisbane Abattoir.

Extensions to the beef floor at the Brisbane Abattoir have made possible an increase to a 30-butcher gang. Two blast freezers have been installed. Considerable extensions of facilities at bacon factories have been made at Toowoomba, Oxley and Doboy. Several country butchers have installed digesters for the more hygienic and economical handling of waste products.

RESEARCH BRANCH.

Mr. L. G. Newton, Chief Pathologist.

In less than two years this Branch has lost three of its most senior officers by retirement, resignation and transfer. The Director of Research, Dr. J. Legg, retired in February this year, Mr. A. K. Sutherland, who was Chief Husbandry Officer, resigned in August 1955, and Mr. A. T. Bell, Officer-in-Charge, Oonoonba, was appointed to another Branch in December 1956. The importance of long experience in diagnostic and research work requires no emphasis and the loss of such a high proportion of our most senior staff must be reflected in the work of the Branch for a considerable time. Furthermore, it has been impossible to recruit sufficient junior veterinary graduates to reach numerical parity with 1955.

On the other hand, clerical and technical grades are becoming more readily available and the situation here is much brighter.

With the addition of a graduate laboratory assistant, a trained technical assistant and a foreman the staff position at Oonoonba is now more satisfactory than it had been previously and this is reflected in the high standard of work now being done there. It has always been difficult to obtain sufficient staff for the northern laboratory. Although the transfer of two veterinarians with considerable laboratory experience to provide a nucleus at Oonoonba made the position at Yeerongpilly more acute, this action is now paying dividends.

Vacancies in the Branch are Senior Husbandry Officer and Senior Veterinary Pathologist at Yeerongpilly.

BUILDINGS AND IMPROVEMENTS.

The development of the Animal Husbandry Research Farm at Rocklea has continued. With the completion of an additional four yards, eight yards are now available for group feeding of experimental cattle. Permanent cattle working yards incorporating a steel dip, a cattle weighbridge and a photogrid for experimental work have been constructed.

New small-animal accommodation at Yeerongpilly is under construction. Subdivision of the large "kitchen" at Oonoonba into three laboratories has proved most valuable.

VACCINES SUPPLIED.

Details of vaccines supplied are given in Table 1.

TABLE 1.

VACCINES SUPPLIED, 1956-57.

——	Yeerongpilly.	Oonoonba.	Total.
Contagious bovine pleuropneumonia (doses)	294,675	369,000	663,675
Infectious labial dermatitis (doses) ..	43,500	..	43,500
Infectious laryngotracheitis (doses)	39,800	..	39,800
Brucella abortus (Strain 19) (number of calves inoculated)	12,296	..	12,296
Tick fever blood (doses)	33,339	10,941	44,280

The total of 663,675 doses of contagious bovine pleuropneumonia vaccine distributed to stock-owners is higher than ever before. The increase is attributed largely to the extension activities in connection with this disease.

The use of infectious laryngotracheitis vaccine in Queensland is restricted to poultry flocks in which the disease has been diagnosed and only virus from local outbreaks is permitted in the vaccine. The increasing demand for this vaccine, which is prepared at Yeerongpilly, is becoming a problem both of time and of facilities and alternatives for production must be considered.

Our laboratories no longer distribute infectious labial dermatitis vaccine, since it can now be obtained direct from the Commonwealth Health Laboratories. Distribution of Strain 19 vaccine is limited to approved Departmental staff.

There was an increase in sales of blood vaccine for tick fever, especially from Oonoonba, but the number of bleeders supplied—134—was considerably lower than in recent years.

TICK FEVER IMMUNISATION.

Two hundred and thirty-two stud cattle were immunised during the year. This is fewer than for several years, and is perhaps attributable to the unfavourable seasonal conditions, the increased charges for immunisation and the increased numbers of cattle being handled by practising veterinarians. Private treatment is being encouraged, as it enables cattle to be immunised on their home ground and it frees the laboratory staff from this routine work, enabling more time to be spent on research.

DIAGNOSTIC WORK.

The number of specimens received for examination is steadily increasing, accessions for the past year again being a record. Table 2 gives details.

TABLE 2.

SUMMARY OF SPECIMENS EXAMINED.

——	Yeerongpilly.	Oonoonba.	Total.
Number of batches of specimens ..	3,855	675	4,530
Contagious bovine pleuropneumonia complement fixation tests	1,029	1,140	2,169
Brucellosis agglutination tests—			
Cattle	6,749	1,593	8,342
Pigs	2,090	159	2,249
Leptospirosis agglutination tests—			
Cattle	3,462	13	3,475
Pigs	365	..	365
Dark-ground examination of urine—			
Cattle	65	42	107
Pigs	592	6	598
Vibriosis mucus agglutination tests	2,498	574	3,072
Melioidosis agglutination tests—			
Cattle	..	..	..
Pigs	..	211	211
Sheep and goats ..	..	174	174
Melioidosis complement fixation tests—			
Cattle	..	..	..
Pigs	..	36	36
Sheep and goats	..	680	680
Bovine mastitis, milk samples	1,769	30	1,799
Autopsies—			
Fowls	1,562	132	1,694
Pigs	133	13	146
Sheep	53	11	64
Cattle	32	8	40
Horses	..	1	1
Goats	..	..	..
Dogs and cats ..	..	..	..
Other animals and birds	80	28	108

The importance of an adequately staffed and efficient diagnostic service is emphasised by the detection each year of diseases not previously encountered.

During the year we have established the occurrence of botulism in cattle for the first time in Queensland. It is one of the causes of the coastal ataxias in cattle. We had previously shown that swamp grasstree (*Xanthorrhoea hastile*) and zamia (*Macrozamia* spp.) cause inco-ordinating diseases but emphasised that they do not represent the complete picture.

Recent tests with intestinal contents from cattle in the Maryborough district showed the toxin of *Clostridium botulinum* to be present. The toxin, type D, is different from those involved in other parts of Australia; these are types B and C, the latter being the more prevalent. A vaccine is available for use against type C toxin, and as C and D have some antigenic factors in common some protection against the local disease may be afforded.

Johnes disease was diagnosed on clinical and microscopic grounds in a bull introduced from New South Wales to the Cloncurry area.

Chromobacterium violaceum was cultured from abscesses in the organs of a pig in the Townsville area This organism is generally believed to be non-pathogenic, but there are records of its causing fatal pyaemia in man in other countries and it has also been recovered from abscesses in pig lungs in the United States of America. Tests at Oonoonba showed the organism to be pathogenic for mice and guinea pigs. Examination of water samples showed the organism to be present in swamps at the Oonoonba laboratory. Its distribution thus lends itself to ready invasion of wounds in the skin or even by mouth.

A total of 1,799 milk samples was examined during the year. The usual pathogenic types of organisms were recovered in the following numbers—*Staphylococcus pyogenes* 364, *Streptococcus agalactiae* 101, *S. dysgalactiae* 96, *S. suberis* 10, *S. zooepidemicus* 5, *Klebsiella* 14, *Corynebacterium pyogenes* 1. The samples are from relatively few herds.

Unusual types of organisms were detected in milk samples from two herds. Organisms belonging to the genus *Pasteurella* were recovered from one herd over a period of 12 months. In addition to producing an acute mastitis with thick, ropy milk, some cows showed severe systemic effects. When this infection was brought under control the more common pathogens became prevalent.

Lancefield Group O streptococci were recovered from a herd in which 20 of 25 cows showed systemic symptoms and painful quarters with brown milk. This type of streptococcus was originally isolated from human throats in England. As far as we are aware it has not previously been associated with animal diseases.

Streptococci have also come under more careful scrutiny in connection with pig diseases. Although they have been associated with arthritis in pigs for some time we have not previously found them to cause severe losses with septicaemic diseases. On one farm 16 piglets of 31 died from acute infection. They showed fever, lameness, swollen joints, stiffness, convulsions and death.

Psittacosis, which is potentially dangerous to man, was confirmed in parrots and finches in the Brisbane area. No fewer than 240 parrots died in one outbreak following the introduction of wild-caught parrots from Warwick. In the previous year the aviary concerned also suffered heavy losses when parrots were introduced from South Australia.

Of the diseases which are more commonly diagnosed and which constitute a constant source of loss to the animal industries, salmonellosis is a very important one. Salmonella were recovered from 69 specimens—43 from pigs, 15 from cattle, 2 from sheep, 5 from fowls (one of which was *S. pullorum*), 2 from ducks and one each from turkeys and cage birds. The small number of recoveries from chickens is in contrast to recent years.

More spectacular losses were associated with two infections which normally do not cause high death rates in this country. Infectious labial dermatitis (scabby mouth) together with mycotic dermatitis caused the death of 70 of 320 lambs 1–3 weeks old. All of the lambs had sore lips covered with pustular scabs which prevented sucking. The lesions extended to the ears and caused wet sores also on the coronet. Erysipelas killed, in one week, 30 of a total of 130 pigs purchased on the Darling Downs and moved to Ipswich.

Poisoning has again killed considerable numbers of animals. Arsenical poisoning was confirmed by toxicological examination of specimens from cattle on 37 occasions and once each in pigs and horses. Positive results for lead were obtained on three occasions in cattle and once in dogs. Phosphorus was found in specimens from pigs and geese.

The newer drugs have also been responsible for deaths. Two outbreaks of aldrin poisoning in cattle occurred at Gympie. The symptoms were typical of the toxic effects due to the chlorinated hydrocarbon group to which the drug belongs, viz. champing of the jaws, salivation, inco-ordination, tetanic spasms, excitement, lying down, making paddling movements and finally death. Sulphaquinoxaline poisoning occurred on several occasions in chickens being treated for coccidiosis. Death sometimes occurred before the course of treatment was completed: on other occasions the birds died afterwards when evidence of coccidiosis had disappeared. The lesions seen most constantly were haemorrhages in the myocardium, greyish necrotic areas in the liver and haemorrhagic spots sometimes closely resembling lesions of coccidiosis in the intestine. Nitrofurazone also caused deaths of chickens which were accidentally overdosed with this drug. Within half an hour of treatment the birds became highly excitable and flew wildly around the pen, squawking loudly. Death occurred soon afterwards.

Of the number of diseases which remain undiagnosed, two may be mentioned. In a flock of 3,500 Merino sheep in the Roma area about 100 became completely or partially blind. Smaller numbers were affected on three nearby properties. Two affected sheep were sent for examination at Yeerongpilly. Degeneration of the optic discs could be seen with the opthalmoscope in one but not in the other. Microscopic examination showed extensive destruction of the optic nerves in both. Another disease was reputed to have caused the death of two litters of pigs at Ormeau. After short exercise such as running to the feed trough the pigs squealed and died suddenly. Four pigs were autopsied. In three of these death followed rupture of the aorta; the fourth was destroyed after being kept under observation for some weeks. All showed damage of the wall of the aorta varying from slight cracks or shallow erosions to rupture of the wall. Microscopic examination has shown nothing more than mechanical disruption of the inner coats of the wall of the artery.

Several plants came under suspicion as the cause of deaths. These include *Solanum pseudocapsicum, Cestrum parqui, Datura stramonium, Terminalia oblongata, Planchonia careya, Trema aspera, Melia dubia,* and *Verbesina encelioides.*

Of the parasitic diseases, trombidiosis was diagnosed in sheep skin specimens from the Muckadilla area. This disease had not previously been diagnosed outside the Clermont-Springsure area.

The stickfast flea of poultry is now established in widely separated parts of the State. Specimens were received from Cribb Island, Chinchilla, Bell, Barcaldine and Longreach.

Psorergates ovis (itch mite) was detected in two sheep flocks at Stanthorpe.

RESEARCH.

Protozoan Diseases.

Tick Fevers.—Research into this group of diseases has been greatly expanded and five senior officers are now contributing to various projects in this field. A veterinarian is undertaking two years' post-graduate study in protozoology at the University of Queensland Veterinary School.

Aspects of the disease being investigated are:—

(*a*) *Epizoodemiological Studies.*—Little is known of the level of infection in herds in the enzootic areas and just how new outbreaks are initiated: whether calves or older animals are more important in the spread of disease, and so on. No recognised procedures for obtaining this information are available. Initially, therefore, investigations have been confined to obtaining histories of various herds and examining smears on a herd basis. The chosen herd suffered a natural outbreak of tick fever (*Babesia argentina*) in early January. Of 83 smears collected in March, four contained amoeboid forms of *B. bigemina.* These were from both young and old animals. Smears from calves up to 12 months showed no *Theileria mutans* though they were grazing with adults with positive smears.

This work, even in its present form, may therefore yield useful information.

(*b*) *Natural History of Infection.*—A group of calves has been obtained for studies with pure infection of *B. argentina* to determine in which stage or stages of the tick's life cycle infection is acquired and transmitted, for how long cattle are infective for ticks, and for how long ticks are infective for cattle. "Clean" ticks are now available for this work.

(*c*) *Immunity Studies.*—A preliminary experiment in 1955 suggested that calves from cows immune to *B. argentina* are resistant to this infection whereas calves from susceptible cows can be readily infected. This observation is being more fully investigated at Oonoonba.

Experiments have been undertaken to show whether serum from recovered cattle has protective properties. Serum from such animals was injected two hours before, with and two hours after a dose of virulent blood. Results so far have failed to show evidence of protection.

(*d*) *Chemotherapy.*—New drugs are being tested as they become available. For those cases which do not respond satisfactorily to the quinoline drugs, euflavine is still the drug of choice. It suffers the real disadvantage, however, of requiring intravenous injection.

(*e*) *Vaccine Studies.*—The persistence of infection with and without "boosting" is being tested in "bleeder" cattle with a view to reducing the number of animals required for vaccine production.

Blood vaccine stored under deep freeze in 7½ per cent. glycerol has given positive transmissions up to the sixth week but not longer. Successful storage for long periods has great possibilities.

(*f*) *Anaplasmosis.*—We now have available a pure strain of *Anaplasma marginale,* and investigation of the disease is being planned.

Coccidiosis of Poultry.—The drugs commonly used to control this disease may produce toxic effects, especially if treatment is prolonged. Furthermore, they are costly. A series of experiments was therefore conducted to determine whether a combination of the sulphonamides and the antimalarial drug pyrimethamine would give effective control as shown by overseas workers who found that the amount of sulphonamides could be reduced to about one-tenth of the usual therapeutic dose. Though some synergism occurred in our experiments we could not confirm the findings of other workers. The method cannot be expected to stop field outbreaks of coccidiosis.

Bacterial Diseases.

Leptospirosis in Pigs.—As our first experiment, mentioned in last year's report, failed to show clearly whether *Leptospira hyos* infection might cause stillbirths or abortion, the experiment was repeated. All six sows infected by intermuscular injection farrowed at full term. Of 70 piglets born, 21 were dead at birth; two of these were mummified. Thirteen of the stillborn piglets, however, were produced by one sow which had a persistent bacilluria due to *Escherichia coli* before, during and after pregnancy. No leptospira were seen in this sow but they may have been obscured by the *E. coli* organisms. Of 46 pigs farrowed by the four control sows, three were dead. The figures will be analysed statistically to determine their significance. The *E. coli* infection is being investigated.

Ovine Brucellosis.—The Merino ewe flock used in the 1955-56 experiment was again mated, the controls as well as those previously mated to the infected rams being included. Three infected rams were used, including the one used in the earlier experiment.

Eight lambs have been born; two died within 48 hours of birth. Again no brucella were isolated from milk samples obtained from ewes or the tissues of the lambs.

Melioidosis.—Investigations have been directed towards developing a reliable serological test to detect infected animals. This is essential, because many infected animals do not show conspicuous symptoms. The serum agglutination test was found unsatisfactory. A complement fixation test has been developed and its efficiency is being evaluated. The work has been greatly facilitated by a natural occurrence of the disease in the sheep flock at the Oonoonba laboratory. This may also enable us to obtain information on the epizoodemiology of the disease.

Parasitology.

Blowfly Strike in Sheep.—Observations on the use of insecticides for the prevention of body strike in sheep were continued. The test insecticide was jetted into a strip about 12 in. wide along the back from the base of the head to the butt of the tail. The efficacy of a treatment was measured by placing implants of freshly hatched *Lucilia cuprina* larvae on the skin and checking larval survival 24 hours later.

In one experiment diazinon gave disappointing results. The 0.005 per cent. and 0.01 per cent. treatments had lost their efficacy when first checked 7 and 8 weeks after jetting. A 0.02 per cent. treatment was efficacious for 12 weeks but not for 13 weeks, and a 0.04 per cent. treatment was efficacious for 14 weeks but not for 16 weeks. These periods are about half of those expected from previous experiments. No satisfactory explanation can be offered for this relatively short period of protection and the sudden loss of efficacy. A small trial using the same emulsion with and without the various additives failed to throw any light on the problem.

A second experiment (not yet completed) using the same type of emulsion is giving results more in keeping with our previous work. The 0.02 per cent. treatment was efficacious for 17-18 weeks and 0.04 per cent. is still effective 19 weeks after treatment. This experiment has shown that 0.04 per cent. diazinon applied as a spray to the tip of the fleece along the back at a rate of 1-2 pints per sheep is not effective in preventing body strike for more than 8 weeks. A tip spray of 0.1 per cent. has given erratic results but can still be regarded as effective 19 weeks after treatment. Dieldrin as a tip spray at 0.1 per cent. was not effective when checked 4 weeks after spraying.

Another preparation—"Notox" (Bayer L13/59)—was investigated as a protection against body strike. Concentrations from 0.04 per cent. and 0.5 per cent. of a wettable powder or emulsion were not efficacious when checked 3 weeks after treatment. An experimental emulsion, known to us as Coopers IP2, applied at a concentration of 0.05 per cent. and 0.1 per cent. was effective for 8 weeks but not for 10 weeks.

Cattle Ticks.—In collaboration with C.S.I.R.O. at Townsville, observations on the extra-parasitic stage of the life cycle of *Boophilus microplus* have been made. Larvae could not be detected 17 weeks in winter and 11 weeks in summer after engorged females were placed in suitable test areas at the base of grass tussocks. A fall of 4½ in. of rain in one afternoon did not reduce the number of larvae on the grass. Eggs on high ground remained viable after 11 in. of rain but immersion in muddy water for 24 hours just prior to hatching greatly reduced the hatch. No larvae were produced from eggs immersed for 5 days during the later stages of incubation.

Testing of insecticides for tick control was directed at determining whether the application of two treatments with organic phosphorus at short intervals would destroy all tick life on treated animals without harmful effects on its host.

Briefly, the results showed that two treatments at 8, 16 or 24 hours interval with 0.05 per cent. diazinon or 0.5 per cent. malathion destroyed all ticks without harming the cattle. Horses given repeated treatments also showed no ill effects. Successful application of this procedure would obviate the costly delay in moving cattle from clearing points.

Poison Plants.

Morinda reticulata.—The symptoms and lesions of change-hoof disease mentioned in our last report are suggestive of selenium poisoning and this plant came under suspicion as a source of this element. Although our earlier trials had given negative results it was decided to repeat the experiment. A horse weighing 830 lb. was fed 138 lb. of the plant over a period of 80 days. The selenium content of the plant varied from 109 to 720 p.p.m. on a moisture-free basis. The first symptoms of lameness were noticeable 56 days after feeding commenced and became acute within a few days. Abnormal hoof formation was noticeable around the coronet at this stage. Subsequent development of the hoof was wrinkled and uneven. Only a small amount of mane and tail hair was lost. Autopsy showed no abnormality other than the hoof changes. Selenium levels in the hair, affected hoof and organs were consistent with selenium poisoning.

Trachymene glaucifolia.—Field reports from the Charleville area indicated that *Trachymene glaucifolia* might be responsible for deformities in lambs known locally as "bent leg" and also distress in older sheep during mustering. Six weaners ate 200 lb. of the plant over 100 days without showing any abnormalities other than those attributed to maintenance on a low quality ration over a long period. The plant fed was mature and in later stages dried out. Field evidence suggests that the young plants are more toxic.

Xanthorrhoea hastile.—This plant has been shown to cause an ataxia of cattle referred to in the Gympie area as wamps. Work at Townsville has now shown that a similar disease is produced by *Xanthorrhoea* sp. aff. *media,* the local species.

Two heifers were fed. One receiving the flower spike developed the typical ataxia after eating 284 lb. in 63 days. The other, fed the smooth stalk only (the flower spike was excluded), showed similar effects after ingesting 102 lb. in 32 days.

Nutrition.

Drought Mitigation Studies.—In the report for 1955-56 the results of a preliminary experiment to determine the suitability of bush hay (native pasture hay) as a drought reserve fodder were presented. In that experiment, the feeding of bush hay from the Central Highlands plus a mineralised lick permitted heifers in store condition to survive a 6-months experimental period with a slight loss (20 lb.) in body weight. Additional supplements of lucerne chaff (1.3 and 3.0 lb/head/day) and meatmeal (0.4 lb./head/day) resulted in animals gaining weight. Weight gain and bush hay consumption were related to rate of supplementation.

In the experiment of 21 weeks' duration now being reported, the same batch of bush hay was used to determine:—

(*a*) Whether the provision of a 50/50 salt-bonemeal lick to cattle fed this type of bush hay is beneficial. (In the 1955-56 experiment a high voluntary lick intake was recorded in the group fed bush hay without other supplements).

(*b*) If similar results could be obtained by substituting grain or grain plus urea for lucerne chaff or meatmeal.

(*c*) Whether nitrogen or carbohydrate was the major limiting factor to liveweight gain.

The experimental design was similar to that described in the previous experiment, four groups of six Hereford heifers approximately 2 years of age being used in the following treatments:—

Group 1—Bush hay *ad lib.*

Group 2—Bush hay *ad lib.* + lick *ad lib.*

Group 3—Bush hay *ad lib.* + lick *ad lib.* + 1 lb. crushed sorghum/head/day.

Group 4—Bush hay *ad lib.* + lick *ad lib.* + 1 lb. crushed sorghum, 2 oz. urea and 0.17 oz. sodium sulphate/head/day.

To simulate probable field application of drought feeding, the heifers were reduced to low store condition before commencement of the experiment. The bush hay was again fed long chaffed and the lick contained equal parts of salt and degelatinised bonemeal to which were added 8 oz. of copper sulphate and 2 oz. of cobalt chloride per 100 lb. of lick.

The experimental results are summarised in Table 3. In these studies, experimental animals were confined in small yards to restrict energy expenditure. As the experiment progressed they became lethargic and thus voluntarily restricted energy output still further. This technique of drought feeding may have contributed to the successful use of bush hay.

It has been demonstrated on a typical bush hay which may be conserved in the Central Highlands that:—

(*a*) Bush hay is readily eaten by cattle and allows survival for protracted periods.

(*b*) Supplementation with nitrogen-rich supplements (e.g. grain plus urea, lucerne chaff and meatmeal) increases bush hay consumption and also allows heifers in poor condition to gain weight.

(*c*) Although unsupplemented cattle may eat large quantities of mineralised lick it does not appear to be beneficial and possibly indicates a depraved appetite.

Bush hay must therefore be regarded as a potential source of drought reserve fodder, but further investigational work is necessary before general recommendations on its use can be made. Aspects which require investigation are the mechanics of feeding and supplementation, the requirements of different classes of cattle, and the variation in feeding value of bush hays from different localities.

TABLE 3.

Results of Feeding Heifers on Supplemented and Unsupplemented Bush Hay.

Group.	Supplements.			Average body weight (lb.) after feeding bush hay.			Intake. Average/head/day over 21 weeks.		
	Lick *ad lib.*	Crushed sorghum 1 lb./head/day.	2 oz. urea + 0·17 oz. sodium sulphate/head/day.	Initial.	1 week*	21 weeks.	Bush hay (lb.).	Lick (oz.).	Total on air-dried basis (lb.).
1	—	—	—	461	482	442	11.4	—	11.4
2	+	—	—	462	486	438	11.7	6.9	12.1
3	+	+	—	476	489	476	12.6	3.2	13.8
4	+	+	+	466	485	545	14.5	3.0	15.8

* This increase in weight is attributable to rumen "fill". Animals prior to the experiment were fed a sub-maintenance diet.

Supplementation of Low Quality Roughage.—An experiment to determine the effect of supplementing low quality roughage with molasses and molasses plus urea on the growth rate and feed intake of cattle has been completed.

The roughage used was poor quality weathered bush hay, low in crude protein (3.5 per cent.) and high in crude fibre (38.5 per cent.). Three groups of four Hereford heifers, 27 months of age and in forward store condition, were individually fed for 16 weeks in stalls. All cattle received bush hay *ad lib.* and 2 oz./head/day of a 1:1 salt-bonemeal lick. The control group received no additional supplement; the second and third groups were fed supplements of 1.5 lb. molasses/head/day and 1.5 lb. molasses plus 3.6 oz. urea/head/day respectively. The molasses and molasses-urea mixture was fed separately.

The results can be summarised as follows:—

(*a*) The addition of molasses had no marked effect on consumption or digestibility of bush hay. The average weight loss in this group was 0.8 lb./head/day, compared with 1.2 lb. in the control group. This difference in weight loss was not significant.

(*b*) Molasses plus urea supplementation increased bush hay consumption by approximately 45 per cent. and prevented much of the weight loss recorded in the other two groups. Animals in this group lost an average of 0.1 lb./head/day. Both the increased bush hay consumption and the decrease in loss in body weight were significantly different from the other two groups.

The results indicate that if practical methods can be developed to eliminate the problems associated with feeding of molasses and urea, their use as supplements for both low quality pasture and bush hay would be of considerable value.

Rotational Grazing Experiment.—During the year a long-term experiment was commenced, to compare rotational grazing and fodder conservation with set stocking on a predominantly paspalum and white clover pasture. Two groups of 16 Hereford heifers are being grazed on equal areas at a stocking rate of one beast per acre. The area grazed by the rotational group is subdivided into four paddocks, each paddock being stocked for one week in a 4-weeks rotation. Excess pasture in the rotational paddocks is being conserved as silage during summer with a view to feeding it back during the winter.

It is planned to (*a*) compare the growth rates of cattle in the two groups and (*b*) compare the effects of the two systems of management on the yield, chemical composition and botanical composition of the pastures. In addition, because there is biochemical evidence of copper deficiency in cattle grazing on these pastures, half of each group is being maintained copper adequate by intravenous injections of copper sulphate in order to compare the effect on growth rate under both systems of management.

This experiment has been in progress for eight months, but as yet no significant differences between groups are apparent. This work is being done in collaboration with officers of the Division of Plant Industry and the Biochemical Branch.

Copper Deficiency Experiments.—A number of copper metabolism studies are in progress. This work was commenced because grazing cattle at Rocklea have low liver copper storage, despite a satisfactory copper status of the pasture.

For two years copper levels have been obtained at 3-months intervals from 12 cows and 15 ewes grazing the same pasture. Analyses have shown that whereas cattle have levels usually considered low (less than 30 p.p.m.), sheep, except at one sampling, had normal levels. The samples, when levels were low in the ewes, corresponded with lambing in 1955 and it was considered that this may have been associated with pregnancy. However, the results in 1956, when the ewes were divided into two groups (pregnant and non-pregnant), indicated that in this year pregnancy had no effect on liver copper storage. In fact, both groups showed high copper reserves in 1956. Although lambing occurred during the same month in both years there was a marked increase in the proportion of white clover in the pastures during 1956. This pasture variation may have been responsible for the differences recorded in the two years. This experiment will be repeated during 1957.

The differences recorded in liver copper storage of cattle and sheep on the same pasture may indicate that cattle are more susceptible to substances which interfere with copper metabolism. Published work has shown that molybdenum in the presence of inorganic sulphate interferes with copper metabolism in ruminants, and analyses of pasture at Rocklea have shown a satisfactory copper, low molybdenum and a high inorganic sulphate content. Results of a preliminary experiment indicated that moderately high levels of molybdenum and inorganic sulphate in the ration interfere with copper storage to a similar extent in sheep and cattle. Further work on this aspect is in progress.

This experimental work on copper deficiency is being done in association with officers of the Biochemical Branch.

Miscellaneous Experiments.—Other experimental work of a long-term or a preliminary nature in progress at Rocklea includes:—

(i.) A grazing trial with cattle in which the effect of supplementation with phosphate and cobalt in the drinking water is being studied. Production responses are being assessed.

(ii.) An experiment designed to determine if the feeding of Nauru rock phosphate is harmful to young cattle.

(iii.) Studies on the feeding of calves, from one to two weeks of age, with dry meal rations based on cereal grains and buttermilk powder. Initial work, with small numbers of dairy calves, has indicated that it is possible to obtain weight gains of up to 1.1 lb./head/day over the first nine weeks.

Breeding.

Bull Proving Project.—The second year of this project has been completed, using procedures similar to those used in the 1955-56 season. Semen collected, diluted and chilled at Rocklea was despatched by rail three times weekly to the insemination area in the Nambour–Maleny district. Insemination was carried out by officers of the Cattle Husbandry Branch, who kept the relevant records. The only major change this year was that the bulls used had been reared from calfhood at Rocklea. The average volume of semen per ejaculate and the concentration of spermatozoa were higher this year; this may have been due to the intensive management of the bulls for a considerable time prior to their use.

The insemination period was from Oct. 1 to Dec. 21, 1956 (82 days), during which 36 batches of semen totalling 2,770 ml. were despatched. A total of 1,267 first inseminations was done, with a 60-day non-return rate of 64 per cent. Total inseminations were 1,665.

General Semen Supply.—Semen was supplied to Nambour during January and early February, 1957, to (*a*) satisfy demand from some farmers co-operating in the bull proving project, (*b*) evaluate our deep freezing technique, and (*c*) obtain information on methods of handling deep frozen semen in the field. In all, 360 ml. of chilled semen and 139 ampoules of deep frozen semen were sent during this period.

Artificial insemination was commenced on a limited scale on the Atherton Tableland by the Cattle Husbandry Branch during November 1956 and continued until the end of April. Chilled semen was despatched by air to Cairns (approximately six hours flying time) and thence by road transport to Atherton (a further distance of approximately 60 miles). The transport of chilled semen by air over this distance appeared satisfactory and 55 batches totalling 1,700 ml. were sent. During April deep frozen semen was used, to obtain information on its despatch, storage and use at a sub-centre distant from the collecting centre.

Deep Frozen Semen.—Deep frozen semen is being prepared at Rocklea as an insurance against injury or death of bulls being proven in the bull proving project. Approximately 2,000 ampoules are now in storage at Rocklea.

SHEEP AND WOOL BRANCH.

Dr. G. R. Moule, Director of Sheep Husbandry.

The year under review has been an extremely difficult one for the sheep industry. A shearing dispute which commenced in early 1956 was not settled until towards the end of that year. Many woolgrowers were forced to shear their own flocks and this delayed shearing in some districts. By the time the dispute ended most shearing was up to date. However, this was accomplished only at the neglect of much of the usual work on properties.

At the close of the previous financial year the whole of the sheep pastoral country was well grassed, except for a restricted area north of Winton. Here there was adequate pasture, although it was a little drier than in other parts of the State. Herbage was growing profusely in most of southern Queensland, and the outlook for the winter was good. Moderately successful lambings in 1955-56 had brought the State's flock up to 22 million. Good lambings were obtained in the spring of 1956, and at Mar. 31, 1957, the State's flock totalled 23.2 million.

The success of these lambings was influenced by useful spring rain during October in the Warwick, Dalby, St. George, Cunnamulla and Hughenden districts. This was followed by further heavy falls in November, when Emerald, Winton, Hughenden and Julia Creek also benefited. December rainfall was heavy and widespread. Emerald received over 12 in., and all centres except Cunnamulla reported over 2 in. This pattern of rainfall was repeated in January 1957, except that Charleville and Cunnamulla received only light falls of less than one inch. However, the rain in the central-west and south-west and on the Darling Downs was by no means general. Between Blackall and Charleville some properties received insufficient rain and had inadequate grass. On the Darling Downs the planting of winter crops was delayed on many properties. At the close of the year there was adequate dry grass in the north-west, but feed was inadequate in some southern areas. Rain during the middle of June gave some relief in the central and southern districts.

One wool sale was postponed on account of the industrial dispute in the shearing industry. This quickly demonstrated the dependence of Queensland's economy on the wool industry. Fortunately the market remained buoyant. Prices had risen during the second half of the last financial year, when the average price of 76.07d. per lb. greasy was established. The sale of 798,906 bales of wool during the year returned £83 million to Queensland. This is the highest amount ever grossed by the Queensland clip, except for the year 1950-51, when £98,000,000 was realised. Wool still retains its place as Queensland's most important export commodity. In the past year it exceeded sugar and beef, its nearest competitors, by £29 million and £50 million respectively.

The store stock market remained firm, largely as the result of the buoyant wool market.

There were also signs of an increase in the lamb industry. In all, 154,000 lambs were slaughtered. There is considerable scope for expansion of the industry. It seems likely that farmers on the Darling Downs who have been growing cereal crops must swing more towards animal production. In addition, there are likely to be considerable developments in the higher rainfall areas at present occupied by brigalow scrub. These areas are fertile and when developed are likely to carry crossbred sheep. In these circumstances, arrangements were made for Mr. C. R. Smith (Senior Adviser at Dalby) to visit New Zealand during the early part of 1957. He brought back considerable information of value to Queensland and has already conveyed a good deal of this to producers at field days.

Just over 5,000 sheep were shorn on the Toorak Field Station. The average cut per head of the young sheep shorn in August was over 10 lb. The sale of wool and of surplus sheep returned £16,900. The total cost of running the Station during 1955-56, excluding the salary of the professional officer in charge and interest on the capital invested, was £9,700.

STAFF.

Inability to obtain adequate staff still remains a problem. One graduate was seconded to another section of the Department and an Adviser was granted leave of absence to attend the University. An Assistant Husbandry Officer who had graduated in Veterinary Science, after holding a Departmental scholarship, joined the Branch in January 1957. He has been engaged in post-graduate training since March and will return for field duty in December. A female graduate in Agricultural Science was also recruited.

At the close of the financial year the important wool growing centres of Longreach, Barcaldine and Blackall were unstaffed by Sheep and Wool officers. No officer was available to carry out research in sheep fertility under a Wool Research Trust Fund grant, nor were any applications received from scholars wishing to complete their University courses with assistance from Commonwealth Wool Funds.

The Commonwealth Sheep and Wool Extension Services Scholarship Plan was initiated in 1950 and should have provided a useful group of well-trained workers. Its repeated failure has placed the Branch under a severe handicap. Unless undergraduates take a greater interest in these scholarships, it seems that the University scholarship scheme provided by the State will become the only avenue through which young graduates can be recruited. However, it takes five years to train a man in Veterinary Science, and another two years of field experience to equip him adequately for advisory work as a husbandry officer. Even if an immediate start is made to recruit undergraduates under a State or Commonwealth sponsored scholarship plan affording complete training, the first graduates would not be available until 1963.

EXTENSION WORK.

Extension officers contacted 3,550 woolgrowers during the year and conducted 1,393 demonstrations on private properties. Nineteen field days were held and three in-residence schools were conducted. Most woolgrowers were preoccupied by the shearing dispute and this curtailed field work in the greater part of 1956.

The special need for economy during this financial year reduced the amount of travelling field officers could do and the number of visits they could make. Therefore, greater use was made of mass media extension methods. Monthly field days were conducted on the Darling Downs conjointly by the Senior Adviser at Dalby and the Adviser at Warwick. In addition, 101 articles were released to the agricultural press. Sixty-six broadcasts were made over national and commercial stations. Extension articles published in the *Queensland Agricultural Journal* brought the total number of pamphlets and leaflets available from this Branch up to 58. These now cover most of the important aspects of sheep husbandry in this State.

Three in-residence schools for young woolgrowers were conducted with financial assistance from Wool Funds. These were held in the Richmond, Goondiwindi and Tambo districts. Between 25 and 30 men attended each school, and some travelled over 450 miles to be present. Each school was of four days' duration and was organised to ensure that those attending participated in the demonstrations as well as in the organisation and conduct of the schools. Two schools dealt with the problem of increasing the fertility and cuts per head of Queensland's flocks. The third school dealt with recent advances in the control of parasites of sheep.

Three main extension programmes had been emphasised during 1955-56. These were the use of fleece measurement, the prevention of blowfly strike, and the mitigation of drought.

The Wool Biology Laboratory was established in 1949, and after preliminary observations an extension programme was launched in 1952. This was directed mainly towards the Merino studs in Queensland. A magnificent response was obtained and today all of the larger registered Merino studs but one in this State are using fleece measurement as an aid to selection.

Practical methods for the prevention of blowfly strike became available by 1941, and steps were taken immediately to acquaint the sheep industry in Queensland with these advances. During the ensuing decade additional insecticides became available. Some of these proved

extremely useful in "filling the gaps" that still remained in the co-ordinated plan that had been developed for the prevention of blowfly strike. However, controlled experiments on the Toorak Field Station have shown that some woolgrowers may be over-optimistic in their assessment of the length of protection that can be obtained by the use of these insecticides.

On the other hand, excellent results have been obtained by the industry in the control of blowfly strike as the result of its own efforts. The insecticides developed since 1950 placed in the hand of every woolgrower reasonably efficient and cheap methods of protecting flocks completely from strike for 4–7 weeks. Concerted action by the industry has done much to rob the green blowfly that initiates strike of its breeding ground. This in turn has tended to prevent fly waves from developing despite extremely favourable seasonal conditions.

The long run of bounteous seasons has also favoured the spread of worm parasites. Fortunately, there have been considerable advances in their control. New drenches have come on to the market and more is known about the resistance sheep may develop to worm parasites. Although the problem of parasitism is an old one, it was felt that it would be worthwhile dealing with the recent advances at schools that aimed at giving young woolgrowers intensive training in the most modern methods of parasite control.

Cash Value of Extension Work.

Ten years have elapsed since the Sheep and Wool Branch commenced to expand its extension activities. From a modest beginning of 64 demonstrations a year it has increased its services until field officers contact at least half of Queensland's woolgrowers each year and organise about 1,000 demonstrations on private properties. Therefore, it may be worth reviewing the value of this work to Queensland as a State.

Blowfly strike in sheep may be cited as an example. It is more than likely, for instance, that the wave of body strike in 1950 cost the Queensland sheep industry no less than £10 million. Since then a number of additional insecticides have become available. When used in conjunction with such methods as the Mules operation, these will give extremely effective protection against blowfly strike. The extension service has publicised these results and helped woolgrowers apply proven methods of preventing blowfly strike. In the choice of methods alone, the service has helped the industry effect outstanding economies, while the savings in the national income derived from the prevention of blowfly strike are beyond accurate estimate.

There are approximately 14 million sheep in areas where body lice usually occur. It is hard to get accurate data about the cost of lice infestation to the sheep industry. It has often been estimated by wool-brokers that lice infestation reduces returns by as much as 25 per cent. The extension service has been successful in focussing the industry's attention on this source of loss. It has also helped further the adoption of adequate control measures. These can be achieved by the annual expenditure of something like £300,000 on labour and insecticides. Failure to control lice could cost the industry anywhere between £12 million and £14 million annually.

Progress resulting from sheep breeding is comparatively slow because both wool quality and fleece weight have to be maintained. By selecting sheep on their appearance it is hard to speed up the rate of improvement in their cut per head beyond about one-third of an ounce per head per year. However, this can be trebled by using fleece measurement as an aid to selection. The extension service provides these facilities and has explained their use to flock master and stud master alike. As a result, the rate of genetic improvement of Queensland's sheep has been increased. The use of these facilities by stud masters can add an extra ounce of wool per head per year to the cut per head of Queensland's sheep. Spread over the State's flock this means something like a cumulative £300,000 a year.

Drought is the oldest and largest problem facing the sheep industry in Queensland. It would have taken over 100,000 tons of maize, grain sorghum or wheat to feed sufficient ewes to maintain average numbers in each shire between 1943 and 1950. This would have cost between £2 million and £3 million. Since then, sheep and wool extension has helped popularise the conservation of silage and bush hay. Probably 96,000 tons of silage are already in pits in central-western and north-western Queensland. However, it would have taken four times this amount to maintain ewe flocks between 1943 and 1950. Had it been available this would have reduced feeding costs to a little over £1 million, allowing for the addition of a meatmeal supplement. In contrast, the sheep saved by feeding would have earned an additional £19 million from the sale of wool alone.

The prolonged run of good seasons has intensified the problem of worm control in pastoral Queensland. Serious infestations of worms have occurred in many districts where woolgrowers are unaccustomed to the symptoms and losses they cause. The losses due to parasitic worms cannot be measured in deaths alone. The daily food intake of sheep suffering from worms may decrease by as much as 40 per cent. This is because only moderate infestations may depress the sheep's appetite. As a result, growth rates and wool production are decreased.

At the present time there are approximately 9.1 million sheep in areas where parasitic worms occur. Collectively this necessitates the administration of about 54 million drenches annually at a total cost of about £750,000 for materials alone. Add to this the cost of mustering and handling the animals, the lowered growth rates, depressed cuts per head and poorer lambings, and the worm parasites of sheep become a £1 million problem.

It is not contended that the Sheep and Wool Branch has extended this information to every woolgrower in Queensland. Nor is it contended that all the information that has been accepted by the industry has been transmitted by the Branch. Happy co-operation exists between this Branch and many large and reputable business houses. These have been instrumental in publicising many worthwhile practices, as well as in launching new products. The agricultural press has also given outstanding support to extension programmes and has been the means of acquainting woolgrowers quickly and effectively of valuable topical information.

RESEARCH.

Owing largely to the need for economy, the shortage of trained staff and the industrial dispute in the shearing industry, research work on private properties was curtailed. Comparable difficulties also existed on the Toorak Field Station, Julia Creek. However, an active research programme was pursued and some worthwhile results were obtained.

The Semi-Arid Environment.

Attention was focussed during the year on Australia's semi-arid regions by a symposium held in Canberra. It was arranged by U.N.E.S.C.O. and attended by delegates from countries interested in the semi-arid regions, including Israel, French North-West Africa, Pakistan, India, the United States, U.S.S.R. and New Zealand. A paper describing work being done by the Sheep and Wool Branch on the reaction of sheep to the semi-arid environment was presented at the Conference.

The sheep pastoral country in semi-arid Queensland can be divided conveniently into the open Mitchell grass downs of central-western and north-western Queensland, and the mulga scrubs of the south-west. The open downs merge into a broad area of shaded savannah country before the final transition into mulga scrub. To the east of the mulga scrub land there is a transition zone comprising savannah country and open forest grazing land. Each of these areas receives less than 20 in. of rain but free water surface evaporation may be as high as 100 in. a year.

Interesting differences between the productivity of sheep in different districts and in different zones occur. For example, the shires of Richmond and Ilfracombe, in similar climatic zones, each receive about the same average annual rainfall, and Mitchell grass predominates in both. However, Richmond carries only about 15 sheep per 100 acres, while Ilfracombe carries about 25 sheep per 100 acres. The shire of Paroo, in the mulga scrub country, also carries about 15 sheep per 100 acres. However, these sheep cut about 1 lb. more wool per head than those in the Richmond shire. The Paroo shire enjoys a better rainfall distribution; the winter rain is more reliable than in the north; the mulga provides adequate top feed and as a result the sheep enjoy a more even plane of nutrition.

This could account for a substantial part of the difference in the cut per head of sheep in the northern and southern parts of the State. However, this may not be the only cause. Sheep in the central and north experience long spells of hot weather. In the Longreach shire, for instance, there is a significant correlation between the average cut per head and dry bulb temperatures. As the temperatures increase beyond 90 deg. F. the cuts per head fall. In years when the average maximum temperature for the six hottest months rises to 100 deg. F. the cuts per head fall by as much as 1 lb. of greasy wool. Lamb-marking percentages behave similarly, though here the drop is even more spectacular. It has long been known that high atmospheric temperatures render rams comparatively infertile. More recently, field surveys suggested they also reduce the birth weights of lambs, thereby causing heavy losses of new-born lambs.

Work in progress at Toorak Field Station has shown that some animals are better able to produce and reproduce in the semi-arid tropical environment than others. This suggests that a two-pronged attack is required to surmount the most important problems of sheep husbandry in semi-arid Queensland.

Lambing Performance of Nucleus Flock.

One phase of the work on Toorak Field Station has aimed at discovering and developing strains of sheep capable of producing and reproducing satisfactorily in the semi-arid tropical environment. The ability of animals to produce and reproduce is a crude but economic measure of their adaptation to the extremes the environment presents.

It is important to find sheep that are well adapted to Queensland's tropical environment. It is difficult and expensive to change the environment, but it has already been established that sheep in the tropics cut less wool and rear fewer lambs than those in more temperate regions.

There were previous indications from observations on "Maneroo" that some ewes might repeat their lambing performance under difficult field conditions.

In assessing the whole problem it was apparent that differences between groups might be composed of—

(1) Differences due to the ewes.
(2) Differences due to the rams.
(3) Differences due to the paddocks, etc.

By selecting similar paddocks for mating, and running the ewes together for the rest of gestation and for lambing, it is possible to reduce paddock influences.

The rams were selected mainly for their cuts per head. The ewes were selected on cut per head and previous lambing performance where this was known. In 1955 the 5-year-old ewes selected for established breeding performance produced 80 per cent. of lambs marked to ewes mated. When calculated as a percentage of ewes mustered for lamb-marking, this became 81 per cent.

The young ewes, born in 1953 and selected without knowledge of previous breeding history, produced 26 per cent. of lambs calculated on the number of ewes mated. This rose to 34 per cent. when calculated on the basis of ewes mustered at marking.

Significant differences between the mean birth weights of various lambs were found.

These observations were extended in 1956 to include a total of 500 ewes. The ewes were graded within their age groups as being best, 2nd, 3rd or 4th as producers upon their previous breeding record and cuts per head. If the previous breeding record was not available, as in the case of the 2-year-old ewes, the cut per head was accepted as an important guide.

The results of the 1956 trial again suggested that ewes may repeat their lambing performance. The following table summarises the results:—

PERCENTAGE OF EWES THAT LAMBED IN EACH SUB-GROUP.

Sub-Group.	1950 Drop Ewes.	1953 Drop Ewes.	1954 Drop Ewes.	Totals.
Best producers ..	73	65	56	68
Second best ..	65	50	56	61
Third best	69	39	53	57
Fourth best ..	60	25	31	48

The performance of the 2-year-old ewes is an interesting point in this table. Because of their age, these ewes were selected on cut per head alone.

Almost 70 per cent. of all conceptions occurred during the first three weeks of mating. No significant differences occurred between the birth weights of the lambs born to the ewes in the different sub-groups. However, the lambs of the 6-year-old ewes were heavier at marking than those of the other two groups. This was due to slower growth rates of lambs born to younger ewes. Lambs born to ewes in sub-group 4 (i.e., the lowest producers) grew more slowly than those born to ewes in the sub-groups regarded as being more highly productive.

The most highly productive and the second most highly productive ewes were mated with individual rams. Therefore, an opportunity to compare the birth weights of their offspring occurred. There is a strong sire influence on birth weight. This is linked with gestation length and it has already been shown that normal variations are influenced by the sire. The birth weight of lambs sired by ram 4B277 was 8.25 lb., and for those by ram 4B86 it was 7.82 lb. In order to shorten generation lengths, 2-year-old rams were used; 4B277 cut 8.2 lb. clean wool and 4B86 cut 7.53 lb. clean wool in the first year of their lives.

Fertility and Brucellosis.

Epididymitis is inflammation of the all-important marshalling yard where the spermatozoa are stored. Field surveys had focussed attention on the occurrence of epididymitis, and subsequently a Brucella-like organism was isolated as the cause of the disease by officers of the Animal Research Institute.

Field trials had shown that the fertility of rams suffering from active lesions of epididymitis was lowered. However, it was subsequently found that some animals may void the causative organism in their semen without showing any symptoms of epididymitis. An opportunity occurred at Toorak in 1956 to mate two rams with a group of 6-year-old ewes known to be average producers. One ram was producing normal semen and the other produced semen containing the Brucella-like organism that causes epididymitis. Only 48 per cent. of these ewes lambed, giving a lamb-marking percentage of 45. The lamb-marking percentage in the highest group of 6-year-old ewes was 66; in the lowest producers it was 46. All of these ewes were mated with rams whose semen was free from the Brucella-like organism that causes epididymitis.

Improving Cut Per Head.

Improvement in the cut per head of Queensland's flocks has been a constant aim of the work of the Sheep and Wool Branch. Data collected some years ago showed a high correlation between increased cut per head and the amount of money spent on permanent improvements such as fences and water facilities. It was considered that these gave greater control over the grazing animals, thereby allowing for more efficient pasture utilization.

The industry is generally aware of the need for better land use and more intensive development of the country's natural resources. Since the end of World War II a large amount of developmental work has been undertaken as labour and materials have become available. Also, since the end of the war, the fleece measurement laboratory within this Branch has become an important force in assisting stud masters to procure faster genetic gains.

Despite these advances, the work of improving the cut per head of sheep in Queensland is rather laborious and progress comparatively slow. It is small wonder, therefore, that woolgrowers are inclined to grasp quickly at any ideas likely to assist in increasing cuts per head.

The administration of thyroxine to increase the cut per head of sheep was an idea of this type that received prominence recently. Thyroxine, the secretion of the thyroid gland, is known to control the rate of chemical change in the body. During summer, when air temperatures are high, less thyroxine is secreted. This reduces the rate of the chemical changes in the body, thereby decreasing the animal's heat burden. More thyroxine is secreted during the winter when an increased rate of chemical change is required to maintain body temperature. Workers at Lincoln College, New Zealand, found that the administration of thyroxine increased wool

growth. They worked with Corriedale sheep that were fed a standard ration. Subsequently field trials were conducted to determine the effect of thyroxine administration.

The New Zealand work arose as an interesting "by-product" of an experiment designed to investigate the effect of variations in day length upon wool growth. It was found that keeping sheep in an environment experiencing 8 hours of light and 16 hours of dark, instead of exposing them to the normal differences in day length between summer and winter, promoted wool growth. In endeavouring to find which hormone was responsible for this response, the New Zealanders compared the effects of extracts of the pituitary glands and those of the thyroid. They found that thyroxine exerted a marked influence on wool growth during the winter and particularly after the autumn equinox.

An experiment to examine the effects of varying day length on Merino rams has been in progress in the Sheep and Wool Branch for some time. So far no definite results have been obtained, although there is a strong suggestion that wool growth may be stimulated by decreasing day length.

In these circumstances, it was felt it would be worthwhile examining the effect of administering thyroxine to Merino sheep in Queensland. A field trial was commenced at Toorak Field Station at the autumn equinox. One hundred wethers of the same age and weight were used. They were divided into two groups of 50 and a small area on the middle of the right-hand side of 15 sheep in each group was clipped. A rectangle was then tattooed on the exposed skin. Three months later (i.e., at the winter solstice) the wool was clipped from the tattooed area. The sheep were shorn and their fleeces weighed. The wool from the tattooed areas was harvested again at the spring equinox.

During the first three months of the trial the 15 clipped sheep in the treated group produced 187 mg. of greasy wool per sq. cm., while the untreated controls produced 165 mg. of greasy wool per sq. cm. When these results were converted to clean scoured wool their order was reversed—95 mg./sq. cm. for the treated group and 103 mg./sq. cm. for the untreated controls.

At shearing the greasy fleece weights were 11.4 lb. from the 50 treated wethers and 11.2 lb. from the untreated wethers. The average body weights of the two groups were 84.6 lb. and 87.3 lb. respectively.

These results are not in keeping with those reported from New Zealand, but there is probably a simple explanation. The New Zealand work was carried out under conditions favourable to the sheep. In the first instance, the animals had a standard ration, and in the field trials they enjoyed a far more liberal plane of nutrition than the wethers running on Toorak Field Station. The speed-up in body chemistry resulting from thyroxine treatment should increase appetite. After the autumn equinox the quality of the fodder in north-western Queensland deteriorates. Perhaps it is not good enough to provide the sheep with sufficient additional nutriment to increase their wool production.

Therefore, the experiment was repeated during the summer of 1956-57. The thyroxine tablets were implanted at the summer solstice. At the same time wool samples were taken from both the treated and the untreated animals. Further wool samples were taken at the autumn equinox and the winter solstice. Fortunately, there was ample green feed during the first three months of the experiment. There was again no evidence of any increased wool production due to the administration of thyroxine.

Effect of Thyroxine Fertility.

Merino rams in tropical Queensland suffer markedly from high atmospheric temperatures. During hot weather they become relatively infertile and as a result sire comparatively few lambs. This problem exists in other countries too and workers in the United States of America reported that the administration of thyroxine had a beneficial effect on the fertility of rams.

Since 1949 this treatment has been tried on a number of occasions on private properties in Queensland. However, no consistent and clear-cut results have been obtained.

It was realised, however, that the thyroxine implants may be more beneficial to rams than thyroxine given by mouth. It was felt the effects of the implants may last for longer—i.e., they could still exert an influence during the whole or at least the greater part of the mating period.

In all, 40 rams were used to test the effects of thyroxine on fertility in a trial on the Toorak Field Station during autumn. The rams were divided into two comparable groups. None of the animals used in this work showed any signs suggestive of brucellosis. In mid-February one group of rams was treated with thyroxine implants. The other group was left untreated.

Approximately 1,500 ewes were divided into two comparable groups and were run in adjoining paddocks of about the same area and terrain. Mating commenced on March 31, 1957. Daily records were kept of the number of ewes served.

A 25 per cent. random sample of ewes was drawn from each flock on April 20 (i.e., three weeks after mating began). These ewes were then re-mated with vasectomised rams and services were recorded for 21 days. By this means the number of conceptions occurring amongst the ewes joined with the two groups of ewes was estimated. There was no difference between the groups. The overall conception rate was 57 per cent.

Control of Blowfly Strike.

Field trials to test the value of different insecticides in the prevention and control of blowfly strike are not always easy to assess. The work has to be repeated under different seasonal conditions and during fly waves of various intensities. Since aldrin, dieldrin and diazinon first became available they have been constantly tested under field conditions on Toorak Field Station; the results of some trials were reported last year.

Further work was carried out during the autumn of 1957. On this occasion the numbers of fly strikes recorded in groups of weaners subjected to different treatments were recorded. Uncrutched weaners born in August/September, 1956, were used. They were divided into comparable groups after their breach conformation had been examined.

Group 1 was kept as an untreated control.

Group 2 was treated with the Mules operation and tail strip.

Group 3 was jetted with aldrin at 0.1 per cent.

Group 4 was jetted with diazinon at 0.04 per cent.

Group 5 was jetted with Notox at 0.05 per cent.

Group 6 was jetted with malathion at 0.05 per cent.

The object of this trial was to compare the protection against breech strike afforded by the Mules and tail strip operations with that conferred by jetting.

There were 55 young sheep in each group. The following table shows the percentage of sheep struck on the wool of the crutch during the seven weeks after the trial began:—

Group.	Percentage of Sheep Struck.
Controls	18
Mules operation	5
Aldrin	7
Diazinon	5
Notox	19
Malathion	4

This work will be repeated. In the meantime, however, it is suggested that it is advisable to equate the protection afforded by new methods with that provided by such established practices as the Mules operation. This operation need be performed but once in a sheep's lifetime. It confers a lasting protection against crutch strike, which can be augmented by crutching and jetting. A mid-season crutching is usually considered to be necessary in the interests of good husbandry. Combining this with the Mules and tail strip operations and jetting as necessary may be by far the most economical method of preventing fly strike.

CATTLE HUSBANDRY BRANCH.

Mr. D. N. Sutherland, Director of Cattle Husbandry.

In contrast to conditions in 1955-56, rainfall for most of the State was much below average during 1956-57.

In the second half of 1956 shortage of feed was experienced in many districts because of lack of rain. Areas mainly affected were the dairying districts of the Moreton division and the beef cattle areas of the Gulf. Some properties in the Gulf suffered fairly heavy losses of breeders from August to December.

Good general rainfall was recorded in practically all parts of the State in December, ensuring good feed conditions for the first few months of 1957. However, during the first half of 1957 rainfall was well below average in the Central Coast and Highlands, Wide Bay and Burnett, Darling Downs, Maranoa and Moreton districts.

In these districts a serious shortage of feed has developed. The nutritive value of native pastures has declined rapidly and insufficient rainfall has been received to provide grazing crops for winter feed. Dairy production has fallen to levels much below average and hand feeding is being practised widely. Unfortunately, stocks of conserved fodder on most farms are inadequate to meet a period of shortage of feed.

In most districts beef cattle held condition fairly well until the end of April, but marked losses of weight are now occurring in the areas of southern and central Queensland where below-average rainfall has been recorded.

STAFF.

During the year, Mr. G. I. Alexander was granted 15 months' leave of absence to take up a graduate assistantship in the Department of Animal Husbandry of the Oregon State College, U.S.A. Mr. Alexander is undertaking post-graduate studies in the fields of genetics and physiology under Professor Bogart. The additional training and experience gained by this officer will be of considerable benefit to the Department in future beef cattle investigations.

The general staff position has been more satisfactory than in previous years, although there are still some vacancies for advisory officers.

BEEF INDUSTRY.

Market Conditions.

Market prices for beef cattle, as in 1955-56, were at a much lower level than those obtaining prior to 1955. With a continued rise in costs of production this has led to a decrease in the margin of profit to the producer. However, at the present level of costs and prices, the industry is in a reasonably sound position. A feature of market conditions during the year was the introduction of price differentials by most meat companies in favour of younger, lightweight cattle. Throughout 1956 prices for store cattle remained high in relation to the price of fat cattle. This was due largely to the heavy demand by N.S.W. buyers for store cattle. However, the demand has fallen off markedly in 1957 due to unfavourable seasonal conditions in the fattening areas of south-eastern Queensland and New South Wales.

Beef Cattle Investigations.

During the year beef cattle investigations have been in progress on 15 properties where fixed weighbridges have been installed. In addition, investigations have been carried on at numerous other properties with the use of portable weighbridges located at Brisbane, Miles, Gayndah, Rockhampton and Townsville.

Growth Rate Trials.

Observations have been carried on for a number of years on the growth rate of cattle on unimproved pasture at various centres in the State. The results at three centres in coastal and sub-coastal areas are depicted in Figs. 1-3.

The following features have emerged from these growth rate trials:—

(1) Under grazing conditions in coastal and sub-coastal areas of Queensland, growth rate follows a markedly seasonal pattern. Liveweight losses usually occur for about four months during the period April to September of each year.

(2) The growth rate pattern at most centres has shown little variation in different years. Even in 1955 and 1956, which were years of above-average and well distributed rainfall, liveweight losses occurred in the winter months.

(3) At centres in North Queensland, Central Queensland and South Queensland where the dominant species in the pastures are blue grasses and black spear grass the growth rate pattern has been very similar.

(4) The overall liveweight increase per head per year at these centres has been in the range 270–300 lb.

(5) Even with a succession of favourable years, most cattle maintained on unimproved pastures at these centres do not reach prime condition for slaughter until they are four years of age or older.

Fig. 1.—Growth Rate Curve of British Breed Cattle at "Wairuna," Mount Garnet, North Queensland.

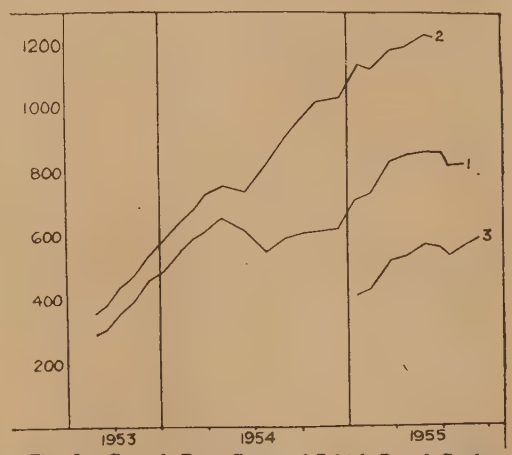


Fig. 2.—Growth Rate Curve of British Breed Cattle at "Eulogie Park," Dululu. 1 = 1953 weaner steers; 2 = 1953 weaner steers on crop from April 1954; 3 = 1954 weaner steers.

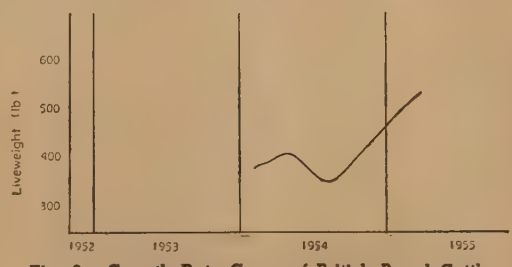


Fig. 3.—Growth Rate Curve of British Breed Cattle at "Brian Pastures," Gayndah.

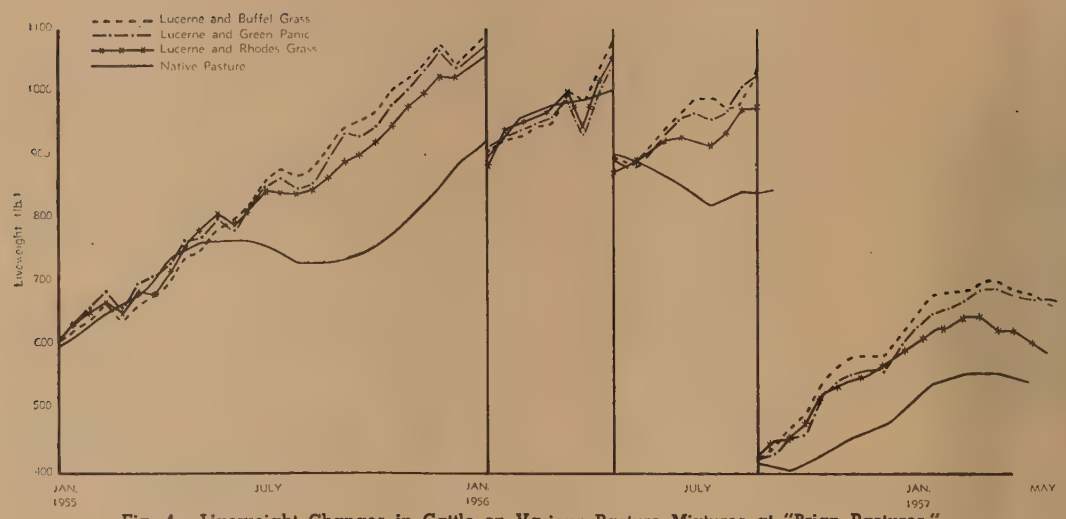


Fig. 4.—Liveweight Changes in Cattle on Various Pasture Mixtures at "Brian Pastures."

Only a limited amount of information has been obtained to date on the performance of cattle on unimproved pastures in western portions of the State. Using a portable weighbridge, observations were commenced at a number of properties in the Miles district during 1956. On one property, cattle on unimproved pasture gained at an average rate of 1.04 lb. per day over the whole year. Liveweight remained at a standstill from April to September, but in spring and early summer, gains at the rate of 2.2 lb. per day were recorded.

Improved Pastures or Crops for Fattening.

On both export and local markets a marked preference is now shown by buyers for the carcases of young animals up to three years of age with dressed weight in the range 550-650 lb. This preference is reflected in the payment of a higher price per 100 lb. for this class of cattle than for older, heavy-weight cattle. The production of cattle of the required type in large numbers does not appear possible on native pastures over much of the State's grazing country and the use of improved pastures or crops for fattening is becoming increasingly important.

At the Bureau of Tropical Agriculture, South Johnstone, the performance of cattle on improved tropical pastures has been studied for a number of years. On these pastures, at a stocking rate of one beast to 1½ acres, an overall liveweight gain of approximately 500 lb. per head per year has been obtained.

At a weighing centre in typical grazing country of the hinterland of North Queensland, it has been found that cattle of British breeds reach a liveweight of about 550 lb. at about 18 months of age. Brahman crossbred cattle on the same property weigh approximately 100 lb. heavier at that age. If cattle reach this weight at the end of the wet season and remain on native pastures they will lose weight during the winter and will not reach marketable condition for some years. If they are moved to improved tropical pastures, such as those in use at the Bureau of Tropical Agriculture, they should reach marketable condition as ideal chiller type beef at about 2½ years of age.

The use of these improved tropical pastures is also being investigated at Utchee Creek in country typical of a large area considered suitable for the early fattening of cattle. A weighbridge was installed at this centre during the year and weighing trials on improved pastures are now in progress.

At the Ayr Regional Experiment Station, improved tropical pastures under irrigation have been grown for some years. On these pastures, gains of 1.26 lb. per head per day over the whole year have been obtained with a stocking rate of more than a beast to the acre.

A trial is in progress at present to study the performance of yearling steers on these pastures. These cattle were introduced to the irrigated pastures in April 1957 when they were about 18 months old. It is anticipated they will be marketed as fats before they are 2½ years old. Comparable steers have been retained on their property of origin and are to be introduced to the improved pasture after the winter. The performance of the two groups will be compared to study the effect of a drop in liveweight in winter on the subsequent performance of the steers.

At "Brian Pastures" Research Station, Gayndah, observations have continued on the performance of cattle on improved pasture mixtures. The mixtures consist of lucerne with one or other of the species green panic, buffel and Rhodes grass.

The performance of cattle on these pasture mixtures in comparison with cattle on native pasture is shown graphically in Fig. 4.

Cattle maintained continuously on the improved pasture mixture have shown an average liveweight gain for the 12 months of approximately 450 lb., whereas comparable animals on unimproved pastures gained only 300 lb. As the stocking rate on improved pastures was one beast to 4 acres, compared with one beast to 8 acres on unimproved pasture, the liveweight increase per acre on improved pasture is considerably greater than on unimproved pasture.

Three groups of cattle have now been turned off these pastures and data on the carcase weight and grade of all cattle have been obtained. Practically all carcases have been graded as either baby beef or first grade for export.

Observations on the performance of cattle on crops have been made at "Eulogie Park", Dululu, and "Yandarloo", Miles, and on improved pastures at "Texas Station", Texas.

Breed Comparisons.

Comparisons of performance of cattle of British breeds and crosses between breeds of British and of Indian origin have been continued at "Wairuna", Mt. Garnet, "Belbroughton", Kunwarara, and "Eidsvold Station", Eidsvold. Some of the results of these trials are summarised in Table 1.

At "Wairuna", the crossbred group was the progeny of three-quarter Brahman bulls out of British-bred cows. At "Belbroughton", the crossbred group was the progeny of half-bred Brahman-Hereford bulls out of Hereford cows. The crossbred group at "Eidsvold Station" was the progeny of Santa Gertrudis bulls and Hereford cows.

The results of these trials indicate that under these conditions Brahman crossbred cattle will perform better than cattle of British breeds.

However, the problem of developing breeds or strains of cattle best adapted to the environment of the various beef cattle areas of the State remains one of the major problems of the industry. The development of these breeds or strains must be undertaken from two approaches. Firstly, in the British breeds a marked improvement could be expected by selection for actual production in the environment in which commercial cattle are raised, rather than by selection on performance under highly artificial conditions. The second approach is to develop new breeds of cattle by crossbreeding between British and Brahman cattle and then selecting and interbreeding the best types. The latter method calls for the highest skills in animal breeding but it is no more than has been done by Australian breeders in the sheep, dairy cattle and poultry industries.

TABLE 1.

Growth of British and Crossbred Cattle at Various Centres.

——	Initial Weight. 5–11–52.	Final Weight. 9–5–55.	Gain.	Dressed Weight.	Reject for Export.	Grading.	
						1 st.	2 nd.
	Lb.	Lb.	Lb.	Lb.	%	%	
"Wairuna", Mount Garnet—							
British breed*	322	928	606	454	17·5	6·5	76
Crossbreds*	370	1,068	698	544	6.5	30	63
"Belbroughton", Kunwarara—							
British breed†	488	1,124	636	581	19	26	55
Croosbreds‡	479	1,272	793	673	6	79	15
"Eidsvold Station", Eidsvold—							
British breed	256	965	709	465	90	10	..
Crossbreds	278	1,175	897	575	100	..	..

* Age of both groups at slaughter approximately 3½ years.

† Age at slaughter approximately 3 years 7 months.

‡ Age at slaughter approximately 3 years 5 months.

Production Performance Recording.

The system of herd classification and production performance recording used in the beef herd at "Brian Pastures" Research Station has been referred to in previous annual reports. The system comprises the recording of the performance of all breeding cows and progeny on the property as a basis for selection to improve the standard of the herd. Selection of the replacement heifers for the breeding herd for the past two years has been made on the basis of these records, those used being birth weight, weaning weight, yearling weight and a score for conformation at weaning and again as yearlings. A score for each of these factors is given to each heifer and final selection is made on the basis of total score—i.e., the sum of the scores for each factor.

In 1956, 31 heifers out of 59 were selected, and in 1957, 40 out of 66 were selected. Table 2 shows the difference in each of the factors for the selected and the culled groups for both years.

THE DAIRY INDUSTRY.

Current Problems.

In recent years the dairy industry has faced the position where costs of items affecting production have risen considerably in relation to the prices received for the products of the industry. As there does not appear to be any likelihood that the ratio of costs to prices will alter in the near future to the advantage of the producer, the problems of productivity at the farm level warrant very close scrutiny at this stage.

The following points summarise the picture of the industry in this State in comparison with the other eastern States. They are based on the survey made for the period July 1950 to June 1953 by the Bureau of Agricultural Economics in conjunction with the industry and the respective State Departments of Agriculture.

(1) Production of commercial butter per cow was low at 147 lb. in Queensland compared with 158 lb. in New South Wales and 250 lb. in Victoria.

(2) Production of commercial butter per acre was low at 15.3 lb. compared with 31.0 lb. in New South Wales and 59.0 lb. in Victoria.

(3) Production of commercial butter per farm was low at 6,881 lb. compared with 7,866 lb. in New South Wales and 10,676 lb. in Victoria.

(4) Production of commercial butter per £100 invested was low at 90 lb. compared with 111 lb. in New South Wales and 118 lb. in Victoria.

(5) Production of commercial butter per adult male equivalent of labour was low at 4,107 lb. compared with 4,842 lb. in New South Wales and 6,796 lb. in Victoria.

(6) Cost of production per lb. was high at 49.94d. compared with 38.99d. in New South Wales and 38.55d. in Victoria.

TABLE 2.

Production Performance Records No. 5 and No. 6 Heifers—"Brian Pastures".

——	Birth Weight.	Weaning Weight.*	Weaning Grade.	Yearling Weight.	Yearling Grade.	Total Score.
	Lb.	Lb.		Lb.		
No. 5 (Born 1955).						
All Heifers	66 (43–90)†	316 (196–406)	69 (54–82)	496 (338–626)	76 (51–79)	55 (0–100)
Selected Heifers	72 (60–89)	345 (293–406)	72 (65–82)	542 (456–626)	74 (70–79)	75 (60–100)
Culled Heifers	60 (43–90)	285 (196–349)	66 (54–75)	446 (338–516)	70 (51–77)	32 (0–58)
No. 6 (Born 1956).						
All Heifers	66 (40–90)	346 (253–421)	74 (66–80)	471 (352–596)	72 (66–77)	53 (5–96)
Selected Heifers	70 (41–88)	367 (318–421)	76 (69–80)	502 (424–596)	73 (69–77)	70 (47–96)
Culled Heifers	61 (40–90)	319 (253–408)	72 (66–77)	425 (352–520)	71 (66–75)	25 (5–45)

* Adjusted to 180 days.

† The figures in parenthesis indicate the limits within each group for each measurement.

The factors operating in Queensland as revealed by this survey—low production per farm, low production on capital invested, low production per unit of labour employed, and high cost of production per lb.—are to a marked extent heightened by the effects of the 1951-52 drought. Nevertheless, these factors point to the main problems of the industry. Undoubtedly, the major factor contributing to the low productivity of the industry is the effect of unfavourable environmental conditions which operate in most of the State's dairying regions in comparison with the conditions in southern States. However, considerable increases in productivity can be obtained by application of technical knowledge which is available, and increasing, in relation to feeding, breeding and management.

The great majority of dairy cattle in this State are kept on pastures which provide a plane of nutrition adequate for reasonable milk production for little more than four months of the year. In many instances pastures are inadequate for the maintenance of body weight. The liveweight fluctuations in male beef cattle are mentioned elsewhere in this report. The pattern is familiar to most interested in the industry. The organisation of dairy enterprises under similar conditions of nutrition results fundamentally in a position as outlined by the six points from the survey. Nor is the provision or acquisition of bigger farms, handling more animals, any real solution. Under these conditions, where managerial skills and supervisory abilities are spread over a bigger field, then productivity per unit area, or per unit of invested capital or per producing animal, is in danger of falling to lower levels.

The main requirement in correcting this position is an adequate supply of roughage of reasonably good quality for the dairy herd throughout the year, and this can be provided by pasture improvement, use of grazing crops and conservation of fodder for supplementary feeding.

When rain-grown, improved pastures will not provide sufficient feed of high quality at all times of the year to sustain high milk production. Grazing crops can be used to lift milk production at certain times of the year when pasture productivity declines. In most areas, there will be certain periods of the year when an adequate plane of nutrition cannot be maintained from rain-grown pasture or grazing crops, and at these times supplementary feed would be required to maintain production. For this purpose, conservation of summer-grown roughage as silage is the logical course. On farms where facilities are available, pasture or crops grown under irrigation can be used to raise the plane of nutrition when rain-grown pastures are inadequate and may eliminate the need for conserved fodder.

The basis of sound management in any dairy herd is production recording and the correct use of production records for improvement of methods of feeding, breeding and management. In Queensland—as in other States of Australia—a proportion of members of herd recording groups record for one or two years and then discontinue recording. It must be concluded that such farmers regard herd recording only as a method of detecting low producers in the herd, and having selected and culled these animals, consider they can gain no further benefit from recording. Herd recording, if properly used, will enable a farmer to assess the effect on productivity of all his husbandry practices and should form the basis of their evaluation.

In addition to production recording, adequate records should be kept by farmers in respect of all individual cows, of dates of calving, dates of oestrus and service and any other important points such as attacks of disease. To maintain adequate breeding records, it is necessary to keep the bull separate from the cows and to practise hand mating.

The practice of paddock mating, with the bull running continuously with the cows, is conducive to the spread of infectious diseases which cause infertility. It also renders the keeping of adequate records almost impossible and thus makes the detection of the causes of infertility in the herd difficult. Another factor of importance in relation to the spread of infertility and other infectious diseases is the practice, common in most dairying districts, of purchasing replacement animals through saleyards or from other farmers, without adequate safeguards against introduction of infectious disease. The purchase of any animals as replacements is attended by risk of introducing disease, but if this course is unavoidable the purchases should be restricted to virgin heifers, if possible.

The control of infertility in any herd requires, as a first measure, the maintenance of compete breeding records for all cattle in the herd—in all too many herds these records are not available.

Although it is not possible to obtain marked improvement in production in a short period by changes in methods of breeding, as is the case with methods of feeding and management, this aspect of dairy production should not be neglected. Far too many farmers use as the basis for selection of bulls the show-ring performance of studs, rather than the production records of those studs. In the case of stud breeders, the practice of recording each year only a limited number of animals which may be fed at uneconomic levels has been too common.

In breeding for Queensland conditions, the aim should be to breed animals which will produce better than the average under ordinary commercial conditions, rather than animals which will produce at very high levels under optimum conditions. Selection of bulls should be made with the former aim in view.

Bulls proven capable of siring high producers are not readily available, and the next choice should be sons of such bulls whose half-sisters, dams and other close female relatives have high production records. The proving of bulls and the widespread use of proven bulls is facilitated by artificial insemination and this is one of the reasons why the expansion of artificial breeding should be encouraged.

Infertility Investigations.

Work on this problem within the dairy herds of the State is supported by funds made available from the Commonwealth Dairy Industry Extension Grant. An Interstate Technical Committee on Infertility acts as a co-ordinating body between States.

Progress in this State has been good considered either at an absolute level or by comparison with other States. The programme, involving as it does the study of breeding performance of individual cows on the properties of co-operating dairymen, is a long-term project, since data cannot be completed nor analysis undertaken until cows have calved at least twice during the currency of the survey.

The extraction of information from Breeding Record Sheets completed and returned by co-operators is proceeding continuously. With the assistance of the Government Statistician's Office many of the data will be capable of treatment on the punched card system with resulting speed of tabulation and calculation.

The information available from the survey is reported periodically to the Technical Committee mentioned earlier and also has been the subject of papers in the *Australian Veterinary Journal* for July, 1956, and the *Queensland Journal of Agricultural Science* for December, 1956. In addition, appropriate extracts and comments are made available to co-operators and field officers throughout the dairying areas. Some of the highlights of the available data are presented below.

Anoestrus.—About 75 per cent. of survey cows show their first oestrus after parturition by the 70th day. An interval in excess of 100 days between parturition and first heat is recorded for 8 per cent. of survey animals. The incidence of anoestrus is higher in cows that calve during the second half of the year (July to December) than in those calving in the first half of the year. Cows that have calved only once are affected more frequently than cows in other age categories.

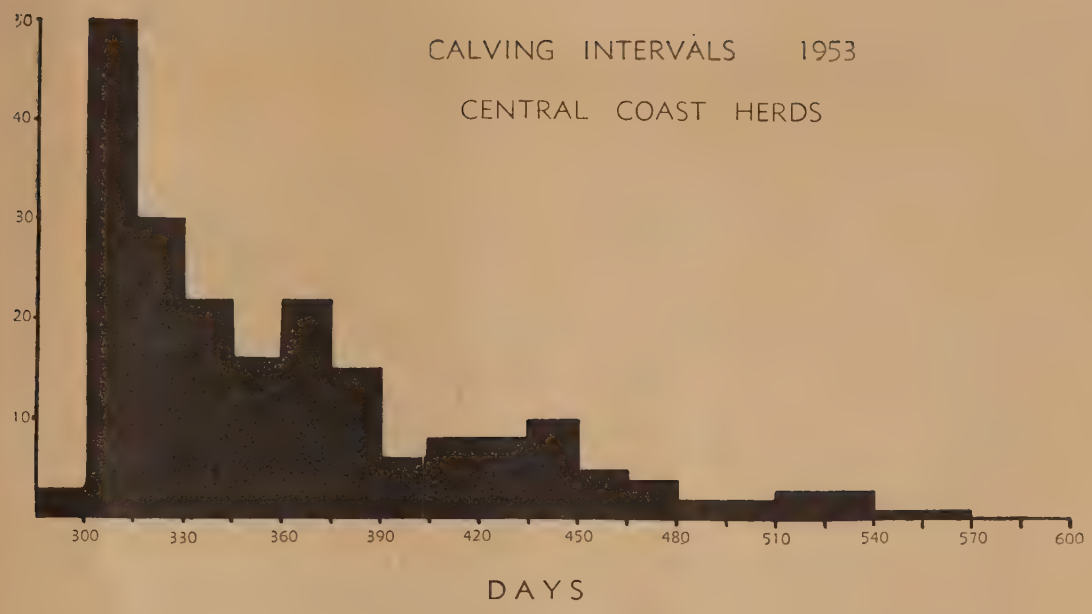


Fig. 5.—The Frequency Distribution of the Interval Between Two Normal Calvings for 213 Cows in Central Coastal Herds.

Interval Between Normal Calvings.—The survey indicates that 25 per cent. of cows have intervals between calvings that are excessively long. For instance, 10 per cent. of survey cows have an interval exceeding 15 months and a further 15 per cent. an interval between 13 and 15 months. This fact, combined with an average lactation length of 7-8 months, gives an appreciation of the period without profit in the lifetime of the dairy cows of the State.

Services per Conception and Conception Rates.—Survey cows average about two services per conception and have a conception rate at first service of 50 per cent. Both figures are outside the desirable limits and point to a high incidence of infertility.

Abortion.—Abortion terminated about 8 per cent. of pregnancies and was commonest during the seventh and eighth month of gestation.

Examples of the results of the Herd Breeding Survey are shown in Figs. 5 and 6. The data were assembled from survey herds on the Central Coast.

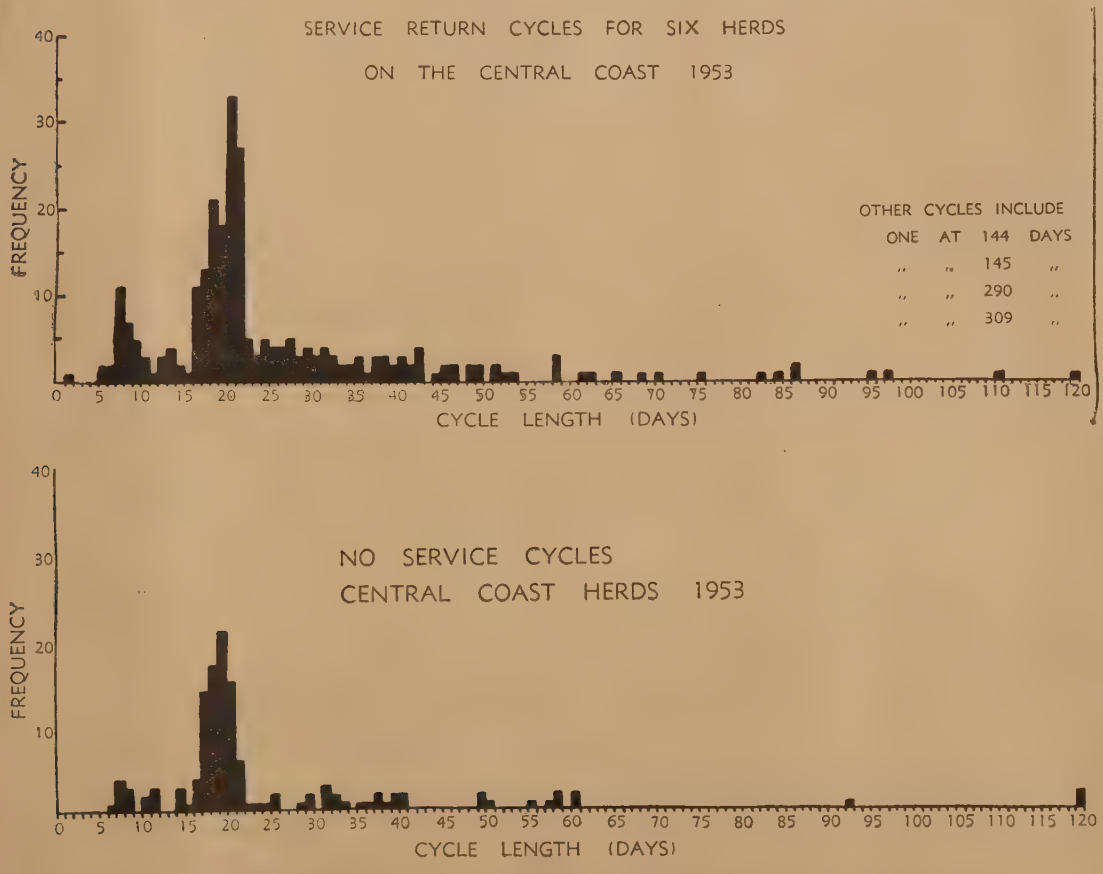

SERVICE RETURN CYCLES FOR SIX HERDS
ON THE CENTRAL COAST 1953
FREQUENCY
40
30
20
10
OTHER CYCLES INCLUDE
ONE AT 144 DAYS
" " 145 "
" " 290 "
" " 309 "
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120
CYCLE LENGTH (DAYS)
NO SERVICE CYCLES
CENTRAL COAST HERDS 1953
FREQUENCY
40
30
20
10
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120
CYCLE LENGTH (DAYS)

Fig. 6.—The Frequency Distribution of Oestral Cycles before Service and Following Service. It will be noted that after service, oestral cycles were more variable than when service did not occur. The high incidence of cycles of less than 15 days was an unexpected result of the survey.

Bull Proving Project.

The second season of artificial insemination in the project commenced on Oct. 1. As in the initial year the work was undertaken in the herds of North Coast recording dairymen who have Jersey or predominantly Jersey cattle. The work embraced artificial insemination in 53 herds, involving 1,665 inseminations. The season concluded on Dec. 21 after 82 days' work. Four young pedigreed bulls were used during the breeding season. The aim is to represent each bull as many times as possible in each herd.

The total number of cows inseminated may be analysed thus:

1st inseminations	1,267
2nd inseminations	313
3rd inseminations	70
4th inseminations	15
Total inseminations	1,665

The conception rate (based on the number of cows which had not returned for service for at least 60 days after insemination) of 64 per cent. was good and compared favourably with similar figures available from other artificial insemination centres. When the fertility rate attained is considered in the light of natural fertility rates as revealed by the Infertility Survey, it becomes apparent that a substantial contribution to infertility control is being made within the area. Herein lies one of the most important aspects of artificial insemination for the dairy industry of the State.

Calving commenced in the first week of July for those cows artificially inseminated during the spring and early summer of 1955. Calvings finished in October.

For 1,223 cows inseminated in the first season the result has been as follows:—

Returned to service	299	
Aborted	75	
Died	28	
Culled	31	
Calf dead at birth	12	
Pre-natal wastage	445	36.4%
Bull calves	415	
Heifer calves	365	
Cows calving	778	63.6%

Regional Experiment Stations.

Biloela.—The purchase of an additional 20 A.I.S. heifers was made during the year. Steps are now being taken to develop two A.I.S. herds on the property. One will be maintained on irrigated pastures and the other on rain-grown pastures.

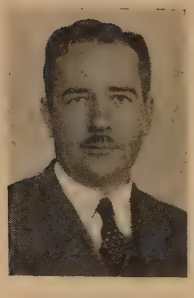
Kairi.—The Jersey herd is now in process of integration into the mixed husbandry demonstration known as X Block. On this area of about 100 acres a sound maize-pasture rotation has been developed over a number of years.

Purchase of the A.I.S. heifers was completed during the year and they will be the foundation animals of the second herd. This herd will be used for husbandry and agronomy experimental purposes.

Housing for bulls and laboratory facilities for collecting and handling semen are expected to be completed soon on the Station and artificial insemination in herds on the Tableland is planned to commence in the near future. Since November, regular consignments of Jersey semen have been air-freighted to Cairns from the Animal Husbandry Research Farm at Rocklea for use in Tableland herds. Frozen semen has been handled in this fashion since April. When the centre is established, both Jersey and A.I.S. bulls will be available. Three young A.I.S. bulls have been purchased as a foundation group, and bulls of Jersey breeding, ready trained, will be transferred to Kairi from Rocklea when facilities are available for them.

PIG AND POULTRY BRANCH.

Mr. A. L. Clay, Director.



By executive minute dated May 30, 1957, a Pig and Poultry Branch was established in lieu of the former separate Pig and Poultry Branches. Reference to this matter is made in the report of the Under Secretary of the Department.

For the present at least the Pig Section and the Poultry Section of the new Branch will function as separate entities. It is hoped, however, that in some centres where there is an officer of the Pig Section but not of the Poultry Section (or *vice versa*) it will be possible in due course to provide at least a partial service in the associated field.

The former Pig Branch and Poultry Branch were small Branches by comparison with the other Branches of the Division. Together, in the shape of the Pig and Poultry Branch, they enjoy equal stature with those Branches. This should assist in recruiting staff to service both the pig industry and the poultry industry, as the long-term rewards in the Branch will be commensurate with those available elsewhere in the Division.

Sectional reports by the Senior Husbandry Officers concerned—Mr. F. Bostock (Pigs) and Mr. F. N. J. Milne (Poultry)—follow.

PIG SECTION.

Feed supplies were variable in all districts.

In North Queensland, ample maize was on hand, due to cyclone-damaged grain being fed to pigs in the first half of the year and to good crops in 1957. The supply of dairy by-products was ample, and meatmeal was available except for short periods. Pastures generally were good throughout the year. Fodder crops such as sweet potatoes, arrowroot and mangolds created interest amongst pig producers, increased areas being grown with good results.

Crops and pastures were adversely affected in Central Queensland. Some wheat crops suffered as a result of frost damage, though generally satisfactory yields were harvested. The few isolated early-sown grain sorghum crops were harvested but the majority of late-planted crops failed and were fed to cattle. Green feed and dairy by-products for pigs were ample until autumn, the position then deteriorating. Ample supplies of protein meals were available throughout the year.

Most farmers in the Burnett area commenced the year with good stocks of grain, but in many cases these were not sufficient to tide them over the 12 months, and summer crops generally were poor. Dairy by-products and green feed were inadequate but meatmeal was available to meet the needs of the industry.

On the Downs and in the Moreton area feed supplies were comparatively poor, winter cereals being far below previous years' harvests and the sorghum crops also below average. Milk by-products were not plentiful and for short periods protein meals were scarce, but otherwise adequate to meet the needs of the industry, although used in greater quantities than usual in all districts. Lucerne has become popular for grazing purposes, especially in the Boonah and Beaudesert areas, while kikuyu grass is being used extensively on Tamborine Mountain. A number of farmers in these areas are now changing to the grazing system of raising pigs.

PRODUCTION.

As was to be expected, production decreased; the total number of pigs forwarded for slaughter was in the vicinity of 380,000, compared with 400,000 in 1955-56.

Throughout the year the seriousness of marketing overfat pigs was kept before producers, but it is disappointing that stricter grading was not enforced by the factories and there is still a tendency among producers to forward such pigs. New South Wales operators were active throughout the year at Cannon Hill, Beaudesert, Toowoomba and Warwick and were not averse to forcing up prices to get their required numbers of pigs, irrespective of the quality on offer. While the supply of pigs remains short of the demand this state of affairs is likely to continue and presents a problem to Queensland factory directorates wanting to impose a price penalty on inferior bacon carcases.

Although producers are aware of the type of carcase best suited to the local and overseas markets and the necessity for producing pigs that will yield such carcases, it would appear that while demand exceeds supply, little permanent improvement will be achieved unless carcase grading is adopted and retained throughout the State.

The price of baconer pigs fluctuated but remained profitable in relation to grain prices. At the beginning of the year the price for baconers was 2s. 6d. per lb. plus factory bonus, and for porkers 3s. 3d. per lb. at auction, and all classes of stores were realising high prices. At the end of the year factories were paying 2s. 1d. per lb. dressed weight plus bonus and at auction the price realised was 2s. 5d. per lb., with porkers at 2s. 6d. per lb. dressed weight. Store supplies eased considerably, due mainly to the dry conditions.

Because of the Northern Pig Marketing Board's policy of maintaining a stable price, there was little variation in rates paid, which were 2s. 2¼d. per lb. on farm for first grade pigs, with 3d. per lb. less for each lower grade. Bonus and deferred pays brought the year's average price to 2s. 3½d. per lb. The freight allowance of ¾d. per lb. was continued. Quality in the area remained very high, the average percentage of first grade baconers exceeding 95. Porker gradings were at a similar level.

STUD SALES.

Field officers of the Branch reported the demand for breeding stock to be very firm throughout the year, resulting in this class of pig being in short supply. Country Show Societies and the Royal National Association have continued the policy that only stock from brucellosis-tested herds is accepted for exhibition, thus assisting farmers to purchase sound breeding stock.

Pig Branch officers continue to receive numerous requests for their services in selecting breeding stock, not only at shows, but also on breeders' properties. Late in the year a representative of the Papua-New Guinea Department of Agriculture, Stock and Fisheries visited Queensland to purchase purebred Berkshire pigs for the establishment of a stud in the Territory. Assistance was rendered by this Branch.

CARCASE COMPETITIONS.

The baconer carcase competition sponsored by the Australian Meat Board was not conducted in Queensland in 1957. Bacon factory representatives in southern Queensland indicated they were not prepared to co-operate further, as they considered that the competitions had served their purpose, that payment on grade gave better results in respect of the improvement of carcase quality, and that the holding of the chilled carcases caused great inconvenience to the factories concerned.

A proposal based on cured carcases was forwarded through the Carcass Competition Working Committee to the Board, in an effort to have the competitions restored in 1958, but no decision had been notified by June 30.

Cured baconer carcase competitions continue to gain in popularity with country shows and an increased number of societies have included the competition in their schedules. This type of competition provides farmers with an opportunity of seeing for themselves the type and quality of bacon produced from pigs raised on their farms and of comparing results with those of other producers. It also provides information in respect of faults exhibited in carcases which should enable the progressive man to improve his pigs.

WORK ON REGIONAL EXPERIMENT STATIONS.

Kairi.

The Tamworth herd of stud pigs at Kairi Regional Experiment Station has been maintained and during the year two boars, one Tamworth and one Large White (the latter for crossbreeding), were purchased to maintain breeding operations.

Two movable shelter sheds were built for use in grazing trials.

Molasses Feeding Trials.—It was considered that replacement of part of the grain in a ration by molasses would be economical on the Atherton Tableland. Accordingly, a trial was designed to determine the amount of molasses which may replace grain in the ration without detriment to the pigs.

One pen of pigs was fed a grain meal ration, a second a low-molasses ration, and a third a high-molasses ration. Both molasses pens received 11 per cent. of their ration as molasses during the period from 75 lb. to 100 lb. liveweight. From 100 lb. to 150 lb. liveweight the low-molasses pen received 12 per cent. and the high-molasses pen 20 per cent., and from 151 lb. to 180 lb. liveweight the low-molasses pen was increased to 15 per cent. and the high-molasses pen to 30 per cent. In order to increase the fibre content of the molasses rations, the low-molasses pen received 1 lb. of Rhodes grass meal during growth between 100 lb. and 150 lb. liveweight and 3 lb. between 151 lb. and 180 lb., while the high-molasses pen received 3 lb. and 9 lb. respectively. The results indicated that molasses may be successfully fed in amounts up to one-third of the total ration and that in order to prevent scouring the fibre content of the ration should be increased in proportion to the percentage of molasses fed. All pigs fed molasses drank more water than usual.

When the molasses is converted to grain equivalent, the rates of food conversion per lb. liveweight gain are very close for the three groups (grain meal ration 3.88, low-molasses 3.9 and high-molasses 3.87). There were no significant differences in the carcases produced.

Hogging Down Maize.—An attempt was made to salvage grain from a cyclone-damaged maize crop by the use of pigs. The area, 16 acres, was cut into three blocks of equal size, using an electric fence. Self-waterers and movable shelter sheds were provided. A protein supplement was made available in self-feeders, the mixture being meatmeal and lucerne meal in the proportion of 1:3 by weight. Apparently it enabled the pigs to balance their ration satisfactorily and no wastage occurred. No other food was available, as frosts had destroyed all palatable weed growth.

Fifty store pigs averaging 67 lb. liveweight and valued at £289 were used. The cost of the protein supplement was £60 12s. 11d., making a total outlay of £349 12s. 11d. The gross return from the sale of pigs (average weight approximately 130 lb. dressed weight) to the bacon factory was £682 6s. 7d., giving a return of £332 13s. 8d. in excess of the cost of the store pigs and protein supplement.

The estimated value of 16 acres of maize yielding 12 cwt. per acre at £14 per ton (had it been possible to harvest) was £134 5s. Thus the trial clearly indicated that damaged maize crops could very profitably be harvested by pigs.

Biloela.

At the Biloela Regional Experiment Station the stud herd of Large White pigs established last year has been increased to one boar and nine sows. Drafting yards and weighing facilities were provided to enable trial work to be carried out. A number of trials were conducted for demonstration purposes. More detailed experimental work will be undertaken when additional facilities are provided.

Meatmeal v. Skim-milk Trial.—A trial was conducted to show the comparative growth rates when using skim-milk or the equivalent of meatmeal in the ration for pigs from weaning to marketing when grazed on good green feed. Two groups were used for the trial, one being fed meatmeal and the other skim-milk. Grain sorghum and green feed comprised the rest of the ration for both groups. The green feed was a mixture of good quality young oats and golden vetches which was grazed continuously. The rations were suitably balanced to allow good growth.

The skim-milk fed group gave a slightly better result than the meatmeal fed group but both groups took a little longer to reach a market weight of 180 lb. liveweight than pigs kept under an intensive system. The pigs consumed an average of only seven bushels of grain during the experiment, indicating that some three bushels were saved by the grazing provided. Half of the pigs graded prime at marketing, and there was no group difference in this respect.

Experimental Grazing.—Experimental grazing plots of cowcane, elephant grass, arrowroot, peanuts, sweet sorghum, mung bean, phasey bean and sweet potatoes have been grown. Elephant grass and sweet sorghum are relished by pigs of all ages. Mung bean is only eaten by older pigs when other green feed is not available, and when eaten, is grazed down quickly. Cowcane, arrowroot, peanuts and sweet potatoes have not yet made sufficient growth to be grazed. Reports of suspected poisoning due to phasey bean have been received over the years but no evidence of poisoning was seen when the bean was fed to pigs locally for a limited period.

Many farmers have taken the opportunity of visiting the pig section at the Station, and methods of feeding, management and housing have been explained.

Hermitage.

The pig section at the Hermitage Regional Experiment Station has seen considerable progress during the year, but unfortunately development has been hampered to some extent due to lack of permanent buildings. When proposed additional pens are constructed the position will be greatly improved. Labour has also been a factor but the appointment of a Field Assistant will relieve the position and allow closer supervision.

The Berkshire stud has been maintained. A boar was purchased late in the year and in addition nine gilts have been selected to replace older stock.

An overhead electric fence line was so arranged as to allow the use of current in any grazing paddock at present in use. A round farrowing house was constructed by Station staff using moulds supplied and will be brought into operation at an early date.

Hogging Down Maize.—A maize feeding trial was carried out during the winter months with 21 forward store pigs. The pigs were turned into the crop, which covered 1.4 acres, to do their own harvesting. Meatmeal at the rate of ¼ lb. per pig per day was allowed as a supplement fed dry in troughs. Based on an estimated yield of 4,130 lb. of maize from the crop, a food conversion efficiency figure of 4.1 was achieved, with an average daily weight gain of 1.16 lb.

Observations made suggested that lighter stores (60-80 lb. liveweight) than those used might give better results, as some wastage of grain occurred.

Early Weaning Trials.—Seven early weaning trials have now been carried out at the Station. Four conducted this year were designed to investigate the practicability of reducing the buttermilk powder from 65 per cent. to 40 per cent. in the No. 1 or first ration fed when the suckers are 10 days of age.

The system of feeding adopted was in line with similar work overseas and comprised two rations. No. 1 was fed from the 10th to the 28th day and a mixture of 50 per cent. No. 1 and 50 per cent. No. 2 between the 28th and 35th days. No. 2 ration was then fed from the 35th day to 8 weeks of age. Good quality green-feed was fed at least three times a week after the first week of weaning. The rations were as follows:—

No. 1 Ration.

40 lb. Buttermilk powder	Plus per 100 lb. of mixture—
40 lb. Meatmeal	1 lb. Aurofac*
2 lb. Lucerne meal	8 oz. Fine Salt
20 lb. Wheatmeal	8 oz. Ground Limestone
20 lb. Maizemeal	50,000 I.U. Vitamin A
8 lb. Sugar	9,000 I.U. Vitamin D_3
	50 mg. Vitamin B_1

* A proprietary preparation containing chlortetracycline and vitamin B_{12}.

No. 2 Ration.

6 lb. Buttermilk powder	Plus—
14 lb. Meatmeal	4 oz. Aurofac
39 lb. Wheatmeal	8 oz. Ground Limestone
39 lb. Maizemeal	8 oz. Fine Salt
2 lb. Lucerne meal	50,000 I.U. Vitamin A
	9,000 I.U. Vitamin D_3

Indications so far are that the reduction of crude protein in the ration from an average of 27 per cent., as used overseas, to 22 per cent., as used here, did not greatly reduce growth; however, the efficiency of utilization of these rations is not quite clear and further trials are necessary to determine whether food conversion rates are affected by the alteration in the rations.

Considering the four trials conducted during the year, the average weights of pigs at eight weeks old from litters weaned at 10 days have ranged from 32 to 45 lb. and the actual cost of feeding per pig to the same age from £1 4s. to £1 11s. at eight weeks of age.

The chief drawback to a general adoption of the 10-day weaning system is considered to be the increased attention necessary, especially during the first two weeks after weaning. All feeding utensils, feeding floors and pens must be kept thoroughly clean, and the pigs require considerably more attention, all of which necessitates additional labour and greater length of time spent at the piggery each day.

COMMONWEALTH EXTENSION SERVICES GRANT.

Moreton Area.

During the past 12 months all Commonwealth Extension Services Grant projects in the Moreton area have made satisfactory progress. The more advanced have received publicity in farming papers and at a Field Day at which restricted feeding, deep-litter pens and pig farm equipment were demonstrated.

At all projects the names and addresses of interested farmers who either inspected or discussed the project with the co-operator have been noted with a view to assessing the value of the various demonstrations as a guide to pig producers. To date 70 names have been collected and the general opinion expressed is very encouraging.

A project at Mt. Beppo has been improved by the addition of a feed shed and three farrowing pens and the installation of a hammer-mill at the owner's expense, while two portable farrowing pens were supplied by the Grant. Pigs bred on this property are eagerly sought by local butchers and many sows have been sold in the district for breeding purposes. First prize at the local show was also awarded to a pen of three bacon pigs from this property.

The portable farrowing pens on a property in the Kilcoy area have been a successful aid in overcoming the problem of disease which had previously forced the production of pigs to a standstill.

It has been found necessary to improve the grazing demonstration in the Thornton area, as the cost of production was not satisfactory owing to insufficient grazing paddocks. An additional lucerne paddock is to be established and materials have been ordered.

A grazing demonstration at Rosewood has made steady progress and is almost complete. Here, selected breeding stock has been introduced together with planned mating; this has resulted in larger and stronger litters born.

A new demonstration has been established in the Fernvale area. On this property, a circular farrowing pen has been erected, using moulds purchased from the Grant. The pen has given very satisfactory service, resulting in considerably fewer deaths from overlaying. The deep-litter and grazing systems of production are to be demonstrated, and when brought up to standard will provide the district with a good all-round demonstration.

A deep-litter demonstration at Beaudesert has been improved by enlarging the pens and fitting large shutters in the back of each pen to improve ventilation. In addition, automatic drinking bowls have been installed. Experience has demonstrated that this system of production is primarily suited to small-crop farms or where the area for pig raising is restricted. Rations fed must have the fibre content built up from when the pigs are approximately 120 lb. liveweight until they are marketed as baconers, in order to guard against their becoming overfat.

Contrary to the early belief that pigs would "snout" through the deep-litter, keeping it stirred up, it has been found necessary in a large number of cases to fork the litter over two or three times a week. This greatly increases the labour involved and as a result consideration is at present being given to the design of deep-litter pens in which the pen partitions are so arranged that they may be easily moved to allow the use of a small rotary hoe to keep the deep-litter in a satisfactory condition and reduce time and labour needs to a minimum.

A mixture of oats and tares, manured with deep-litter material spread at the rate of 34 tons per acre, yielded four times as much as an untreated plot.

Reports indicate that a number of farmers have built circular farrowing pens and established grazing and deep-litter piggeries in the Moreton area along the lines of the demonstrations. It is anticipated that publicity and the opportunity afforded to visit the various projects will encourage other farmers to improve their own pig raising conditions and production.

Burnett Area.

Having regard to the adverse weather conditions, satisfactory progress has been made with all projects in the Burnett area. At Mundubbera, portable farrowing pens, self-waterers and self-feeders were provided and a lucerne grazing area was established, resulting in marked improvement in production. The building of portable sheds, self-feeders and self-waterers at Mulgildie and Coalstoun Lakes created a great deal of interest in the districts. At Monto, a grazing demonstration was established using couch and paspalum, which gave very good results under continuous grazing. At Gayndah and Booyal it was not possible to demonstrate grazing management owing to dry conditions. However, arrangements are in hand to proceed with these projects when conditions improve.

GENERAL.

Two developments during the year which it is considered will greatly assist the industry to increase production are the circular farrowing pen and early weaning.

Circular Farrowing Pens.

Experience with the circular farrowing pen indicates that a considerable reduction in the losses at present sustained from overlaying and accidents during the first five or six days of life after farrowing is virtually assured. These losses are estimated as being approximately 20 per cent. of all pigs born, and assuming production to be 380,000 pigs represent 76,000 pigs lost. Even if the use of the circular pen saves only half the pigs at present lost, an additional 38,000 pigs would be added to the State's production if the pens were universally used.

To assist farmers to build these pens, moulds have been forwarded to each of the six pig-raising districts where Advisers are stationed. They are available on loan to farmers in the area and a full set of instructions on the construction of the pen is issued with the moulds.

Weaning at Four Weeks Old.

Acting on this Branch's advice, weaning at four weeks has been adopted as a regular routine on a large commercial pig farm in the Toowoomba area; results have been most promising.

At four weeks, contrary to the position when weaning is done at 10 days, the suckers have had the benefit of the mother's milk for quite a reasonable period and have taught themselves to eat solid food. At 2-2½ weeks old a small quantity of a suitable ration, made up as follows,

17 lb. Meatmeal	Plus—
40 lb. Crushed Maize	¼ lb. Aurofac
40 lb. Crushed Wheat	½ lb. Ground Limestone
3 lb. Lucerne Meal	½ lb. Fine Salt

is made available behind a creep. This is gradually increased and the feeding continued after the sow has been taken away until the suckers are eight weeks of age.

It has been found that under this system the sows are still in good condition when the litter is weaned and can be returned to the boar during the fifth week after the birth of the litter. It has been found also that the litters produced subsequently are greater in number and more even. With 4-weeks' weaning a sow is capable of producing an additional 1½ litters in two years compared with standard 8-weeks' weaning. These observations are based on results from some 30 litters.

Testing Station.

Progress has been made in respect of the Testing Station at Rocklea. Plans were completed and estimates received during the year, resulting in building operations being commenced early in April. By the end of the year the foundations had been completed and the walls were under construction. It is anticipated that building will be sufficiently advanced by October to allow a start to be made with the installation of ventilation control and gristing plant.

When in operation the Testing Station will provide a means whereby stud breeders will be able to have their stock tested unequivocally for such factors as weight for age at slaughter, food conversion efficiency and carcase quality. Such information will enable producers and intending purchasers to eliminate much of the guesswork from breeding programmes, and select the best blood lines available with certainty.

Not only should the Station give a lead to other States contemplating test work, but the design and standard conditions will be such that test results will be comparable with those obtained in other countries. It is confidently anticipated that the establishment of the station will prove to be a most important milestone in pig production in Queensland.

Health Problems.

Brucellosis testing of stud herds has been continued in conjunction with the Veterinary Services Branch. Ninety-one herds have been issued with appropriate certificates and placed on the list published in the *Queensland Agricultural Journal* each month. A further three herds have entered the scheme, but still have to complete the necessary tests.

The health of pigs in the State generally has been satisfactory. Disease was not a major problem during the year.

In North Queensland, due to the wet season, roundworm (*Ascaris lumbricoides*) was prevalent and infestation led to numerous cases of pneumonia and scouring. Leptospirosis outbreaks occurred on a number of farms in the Millaa Millaa area. They were in most cases caused by *Leptospira pomona* and associated with infected cattle.

In Central Queensland, numerous carcases were condemned at an abattoir due to sparganosis. The majority of these carcases were from domestic pigs which were run at large on melon-hole or swampy areas. This condition is more common in wild pigs.

On the Downs a surprising number of cases of mange have been noted, in spite of the availability of efficient control measures. Post-parturient fever and skin trouble resembling parakeratosis still occur spasmodically.

Salmonella infection and Glasser's disease continue to be the most common diseases in all areas and are responsible for moderate losses on many properties.

POULTRY SECTION.

Conditions in the poultry industry during the year provided a severe test of the relative efficiency of production on many commercial poultry farms, particularly in southern Queensland.

Reduced net returns due to low export prices and higher feed costs associated with wheat shortages and the necessity to import grain from other States have been responsible for a reduced margin of profit on these farms. No further increase in export prices can be foreseen, as the demands of the English market are met almost entirely by home production. It is indeed likely that the demand for Australian eggs in other European markets such as Western Germany could also be reduced by the diversion of surplus English eggs on these markets.

It is considered that there may be a reduction in the number of producers engaged in poultry raising. Already hatcheries report a reluctance on the part of commercial farmers to place firm orders for replacement chickens. It is also significant that seven hatcheries in the Brisbane area have cancelled their registration as stock suppliers.

Overall production in South Queensland is estimated to have been some 14 per cent. higher than in 1955-56. The intake of eggs by the South Queensland Egg Marketing Board was at least 20 per cent. higher from August 1956 to May 1957 than in the corresponding period in the previous year. The increased production from August to December was no doubt due to the increased hatchings in 1955, and the higher production from January until May was due in part to the further increase in day-old chicken production during 1956. It must also be kept in mind that good climatic conditions from January to April kept production fairly constant.

Production in Central Queensland for 1956-57 was 40 per cent. greater than that of the previous year. The industry has expanded in the sorghum growing areas near Wowan, where farmers have built up sizable sideline poultry flocks of 500–1,000 layers. With low production costs due to the extensive use of home-grown sorghum and the benefit of a stabilised market for eggs in Rockhampton, these flocks have been found to be quite profitable.

In North Queensland, production has remained at or near the same level as last year. It is not expected that the industry will expand to any degree, for the supply can satisfy local demand during most of the year.

FEEDING AND MANAGEMENT DEMONSTRATIONS.

During the year, the demonstration of the use of artificial lighting to induce winter production was completed and information obtained was disseminated among farmers through the *Queensland Agricultural Journal* and other media. A further 10 sets of 96 single-bird laying cages were installed on 10 farms to be used for the selection of breeding birds on the individual bird's egg production. Demonstrations of the feeding of an oxytetracycline (''Terramycin'') feed supplement for the prevention and/or treatment of chronic respiratory disease were also undertaken. Feed troughs have been ordered for a feeding demonstration designed to minimise feed wastage.

Artificial Lighting.

This demonstration was designed to show the extra winter egg production that can be obtained by subjecting birds to artificial light in addition to natural lighting to give a 14-hour period of light each day. Three hundred May-hatched pullets were subjected to the 14-hour light day, and records of production were compared with those from 300 similar pullets under natural light only. The extra light was given from March to the end of September.

The results paralleled those of the previous year's demonstration, and confirmed that the increased artificial light was effective in increasing winter production from early-hatched pullets and hens. In early May, the birds on artificial lighting were laying 18 per cent. more eggs than the control birds. Over the full period of 34 weeks, the birds under lights laid 12 per cent more eggs than their unlit controls. Increased food consumption is linked with increased production. In future demonstrations the actual increase in food consumption is to be noted.

As a result of the publicity given by means of Branch extension work, the use of artificial lighting to boost winter production could become a standard practice on commercial farms. It is certain that winter lighting has contributed in no small way to the 20 per cent. increase in recorded production from January to May of this year.

Laying Cage Demonstration.

The additional sets of laying cages installed on 10 hatcheries during the year make a total of 18 sets installed. The cages are installed for the purpose of aiding hatcherymen in the selection of birds for breeding. Birds can be selected on their egg production rather than by the older method of selecting on type alone.

Six hatcherymen who received sets of these cages are participants in the Queensland Poultry Improvement Plan and will be using the cages in conjunction with the testing of their half-sister and full-sister family breeding groups.

High-Level Antibiotic Feeding.

Chronic respiratory disease is fast becoming one of the more common diseases encountered in the poultry industry, particularly during the hotter months of the year.

Seven demonstrations of the value of high-level feeding of oxytetracycline (''Terramycin'') in flocks where chronic respiratory disease has been diagnosed by veterinary examination have been concluded or are in progress. These are being carried out in the Cairns, Bundaberg, Caboolture and Brisbane districts.

QUEENSLAND POULTRY IMPROVEMENT PLAN.

A sum of £2,000 was made available from the Commonwealth Extension Services Grant to assist farmers by way of loan to partly defray the erection costs of suitable breeding pens for testing family production. Six farmers have so far availed themselves of this finance, and well constructed progeny testing pens have been built on their farms. In addition, a further eight breeders have signified their willingness to enter the Improvement Plan. Three of these will be using laying cages and individually recording and pedigreeing the progeny from selected sire and hen families.

Excellent random sample facilities have been built at the Poultry Section of the Rocklea Animal Husbandry Research Farm. They consist of a brooder house and two rows of pens, each row containing 15 pens. The accommodation provides for two 20-bird samples from each of 15 breeders. It is expected that the random sampling of breeding flocks will commence during August 1957.

Further buildings will be required for the random sample test and approval has been granted for the erection of a large intensive rearing house and a third row of pens similar in every detail to those already constructed at the Section.

EXTENSION WORK.

Officers of the Branch paid over 2,882 visits to farms for the purpose of extension work, conducted 576 demonstrations, delivered 21 lectures and gave six radio talks. Of the demonstrations, those of chemical caponising were in greatest demand. Demonstration of fowl pox vaccination was also in very great demand.

Articles on poultry feeding and the winter lighting of layers were published in the *Queensland Agricultural Journal* and a comprehensive article on artificial insemination was submitted for publication.

EXPERIMENTAL WORK.

Kairi Regional Experiment Station.

Breed Production Experiment.—This experiment was concluded in January, 1957. As mentioned in last year's report, the four test groups—Australorps, White Leghorns, Australorp x White Leghorn, and White Leghorn x Australorp—were derived as day-old chickens from Australorp and White Leghorn hens by artificial insemination.

The results obtained from the 48-week laying test are set out in Table 1.

TABLE 1.

Breed Production Experiment—Results.

Breed Group.	Australorp.	White Leghorn.	Aust. x W.L.	W.L. x Aust.
Number of birds at commencement	80	80	80	80
Number of birds at end of test	75	75	72	77
Deaths	5	5	8	3
Hen housed production per bird (eggs)	176·6	156·1	189·0	179·4
Average egg weight (oz.)	2·06	1·94	2·07	2·00
Food efficiency (lb. food required/dozen eggs)	7·66	8·29	7·48	7·38

From these results, it will be seen that the Australorp x White Leghorn crossbreds laid almost 10 eggs more per bird than their reciprocal cross and nearly 33 eggs more per bird that the White Leghorn group. Egg size was also best in the Australorp x White Leghorn group. Had the experiment continued for a full 52 weeks, a hen housed average of over 200 eggs per bird almost certainly would have been recorded.

It will be noted that this group also had the heaviest mortality. For some unaccountable reason, cannibalism was rife in the group, six of the eight deaths being due to this vice. This cross is not a popular one commercially because it is reputed to be prone to broodiness. This is quite understandable, as broodiness is a sex-linked character transmitted from the sire to his daughters. However, a close watch was kept on the incidence of broodiness during the test and little broodiness occurred in this or other groups.

In efficiency of feed conversion, the White Leghorn x Australorp crossbred was slightly more economical than the Australorp x White Leghorn crossbred.

Rocklea Research Farm.

Whale Meatmeal Feeding Trials.—Two experiments on the value of whale meatmeal and whale meat-and-bone meal in chick starter rations were carried out. In the first trial, three experimental rations were used in which the sole source of animal protein was either meatworks protein meal (55 per cent. crude protein), whale meat-and-bone meal (54.5 per cent. crude protein), or whale meatmeal (64.4 per cent. crude protein). These rations were fed to cockerel chickens for six weeks from one week of age to seven weeks of age. The rations and results of the first experiment are set out in Table 2.

TABLE 2.

WHALE MEATMEAL FEEDING TRIAL—RATIONS AND RESULTS—EXPERIMENT 1.

Ingredient.	Ration 1.	Ration 2.	Ration 3.
	Lb.	Lb.	Lb.
Wheatmeal	40	43·5	42·25
Bran	15	15	15
Pollard	26	26	26
Meatmeal (Meatworks)	15	..	..
Whale meat-and-bone meal	..	15	..
Whale meatmeal	..	..	12·75
Ground limestone	1	..	1
Bonemeal	2·5	..	2·5
Salt	·5	·5	·5
Supplements.			
Manganese sulphate (grams)	8	8	8
Synthetic riboflavin (milligrams)	160	160	160
Stabilised vitamin A and D3 (oz.)	·5	·5	·5
EXPERIMENTAL RESULTS.			
Number of chickens at start	27	27	27
Weight at 1 week (oz.)	1·8	1·8	1·8
Weight at 7 weeks (oz.)	26·0	20·9	18·4
No. of deaths	0	1	17
Percentage of deaths	0	3·7	62·9

In this trial, not only were the weight gains of the groups fed on whale protein lower than those of the control group, but deaths were very numerous in the group fed the whale meatmeal, All chickens which died were autopsied at the Animal Research Institute; the post-mortem picture was generally one of multiple haemorrhages, subcutaneous, muscular and visceral. No such symptoms were noted in the single death in the whale meat-and-bone meal group.

The symptoms suggested a rather uncommon form of vitamin E deficiency; this could have been due to the long storage period of nearly 12 months prior to the use of the whale by-products in this work. Rancidity in the whale meatmeal may have destroyed vitamin E in the ration by oxidisation. It was thought also that as sufficient food was mixed to last for the period of the trial this may have given a greater opportunity for the destruction of vitamin E.

The trial was repeated using the ration containing meatworks protein meal as control and ration 3 (whale meatmeal), sufficient of which was mixed (a) twice a week and (b) to last for the experimental period. Provision was also made to subdivide the experimental groups on whale meatmeal and to treat these with vitamin E or vitamin K should the haemorrhagic syndrome appear.

At four weeks of age (i.e., after three weeks of feeding), all chickens fed the whale meatmeal ration whether mixed frequently or not showed signs of subcutaneous haemorrhaging—a "bruised-like" appearance. Two sub-groups in each group were then dosed individually with either vitamin E or vitamin K every two days and the condition disappeared after three weeks of treatment.

The results obtained from this experiment are set out in Table 3.

TABLE 3.

WHALE MEATMEAL FEEDING TRIAL—RESULTS—EXPERIMENT II.

—	Group 1.	Group 2. (whalemeal bulk mixed).	Group 3. (whalemeal mixed twice per week).
Number of chickens	30	30	30
Weight at 1 week (oz.)	1·9	1·9	1·9
Weight at 4 weeks	10·7	8·7	9·8
Deaths (1–4 weeks)	1	8	9
Percentage deaths (1–4 weeks)	3·3	26·6	30·0

—	Group 1.	Group 2—subgroups.			Group 3—subgroups.		
		*N.V.	Vitamin E	Vitamin K	*N.V.	Vitamin E	Vitamin K
Number of chickens per subgroup	..	8	7	7	7	7	7
Average weight at 5 weeks (oz.)	..	11·9	12·5	12·2	10·4	12·7	13·7
Average weight at 7 weeks (oz.)	22·9	17·0	21·7	21·1	20·0	23·1	23·7
Deaths 5–7 weeks	0	1	1	0	3	0	0

* N.V.—No Vitamins Administered.

Although the number of chickens treated with vitamin capsules is probably too few for reliable results, the average weight of the treated groups indicated that the addition of vitamin E or vitamin K had a beneficial effect; this was supported by the disappearance of internal bleeding. Further work using whale by-products of a later date of manufacture is planned.

Vitamin A Deficiency Investigation.—A very comprehensive conjoint investigation of the effect of vitamin A deficiency on egg production, hatchability,

health of adult fowls and liveability of the progeny was carried out in conjunction with the Biochemical Branch.

The plan of the experiment involved feeding two groups of Australorp pullets rations with and without added vitamin A until the field symptoms of nodules in the gullet appeared. The experiment was then reversed. Part of the "deficient" group was placed on the vitamin A supplemented ration and part of the "sufficient" group placed on the vitamin A deficient ration. The remaining birds in each group continued on their original deficient or sufficient rations.

By means of artificial insemination, the fertility and hatchability of eggs from both groups could be investigated without the limiting factor of having male birds on alternate adequate and deficient rations. Birds were sacrificed at certain intervals and their liver vitamin A reserves examined.

Egg production in the deficient group was 23 per cent. lower than in the sufficient group when a deficiency was first noted by liver analysis 11 weeks after the deficient feeding began, and 57 per cent. lower when lesions became apparent. This was nearly 4½ months after the trial commenced. On reversal, egg production returned to normal within two weeks after supplementation with vitamin A.

The hatchability of the vitamin A deficient group was 40-50 per cent. when the deficiency was first established by liver analysis, and 10-20 per cent. when nodules appeared; it finally fell to zero. On reversal, hatchability showed marked improvement after one week of supplementation with vitamin A.

Pullets maintained continuously on a vitamin A deficient ration survived for a maximum period of 39½ weeks after deficiency had been established by chemical analyses and almost 50 weeks after the feeding of deficient rations commenced.

Of the 24 deaths in the deficient groups, 10 were due to uncomplicated vitamin A deficiency.

Chickens from four consecutive hatches, derived from the sufficient and deficient groups, were reared for four weeks. In chickens derived from deficient pullets, losses were 71 per cent. when reared on a deficient chick starter mash, 41 per cent. when reared on a mash supplemented with vitamin A, and 17 per cent. when fed a ration containing five times the normal amount of vitamin A. Losses in chickens from vitamin A sufficient pullets were 25 per cent. when fed a mash without vitamin A, and 4 per cent. when given a ration with vitamin A.

Influence of Livermeal on Occurrence of Rickets.—Poultry Branch officers have on several occasions reported the incidence of rickets in chickens fed rations containing livermeal as the main protein and with adequate amounts of vitamin D3. Chemical analysis shows that livermeal is very much lower in calcium and somewhat lower in phosphorus than meatmeal. An investigation is in progress at Rocklea to see whether rickets produced by feeding livermeal is due to its low calcium and phosphorus content or to some other factor in livermeal.

Four rations are being used. The control ration has meatworks protein meal as the main source of animal protein, while the other rations have livermeal. Of the three rations with livermeal, one was not supplemented with either calcium or phosphorus, a second had both supplements, and a third had calcium only added to it.

The first death in the unsupplemented livermeal group occurred 18 days after the trial commenced and was due to rickets. Within 14 days, the whole of this group had died from the same cause. The other groups having livermeal supplemented with calcium or calcium and phosphorus have not shown any symptoms of rickets to date and their weight gains are of the same order as the control chickens.

Artificial Lighting Experiment.—Three pens each of 25 Australorp pullets hatched in August 1955 were subjected to artificial lighting (so as to give a 14-hour day) for a period of 36 weeks from 1-2-56 to 12-9-56. As a control to this group, three pens of the same breed and date of hatch were maintained without lighting. Hen housed production for the 36 weeks period was 190.8 and 186.4 eggs per bird respectively—a difference of 4.4 eggs per bird in favour of the lit group. This difference would almost certainly have been greater had pullets of an earlier date of hatching, (e.g. May) been used.

At the commencement of 1957, the two groups were each reduced to 50 and the lit group again given artificial lighting as from 1-3-57.

It will be seen from Fig. 1 that production in the lit group from 1-2-56 to 23-4-57—a period of 64 weeks—had shown little evidence of the peaks and troughs in production of the control flock which has been subjected to the normal seasonal daylight variations. It is of interest to note also that the lit group, now in its second year of production, is showing a response again to artificial lighting whilst the control group, also in its second year of lay, is following the normal seasonal pattern of going into a full moult.

RANDOM SAMPLE PRODUCTION TRIAL.

The second random sample production trial terminated at the Poultry Section of the Department's Rocklea Animal Husbandry Research Farm in January 1957. The final points score, awarded on the basis of hatchability, rearability, egg production and livability, ranged from 5,607 to 7,547.

Hatchability and rearability compared favourably with the first random sample test. In the laying section of the trial, not one group went through the 48 weeks without losing one or more birds. The average mortality was 15.1 per cent., compared with 7.91 per cent. for the previous trial. This also influenced the average hen-housed production for this test, as it was nearly 16 eggs below the average for 1955-56.

Mortality had a big bearing on the placings at the end of the trial, for a White Leghorn group with a low level of mortality was the winner despite the fact that the Australorp group in second place had a much higher hen-housed production.

That the avian leucosis complex is still a major disease problem in this State is supported by the fact that no less than 66 per cent. of the deaths during the laying period were due to this disease.

Random sample testing of breeding flocks co-operating in the Department's Poultry Improvement Plan is to commence in August 1957 in the new pens built for this purpose.

DISEASE CONTROL.

The avian leucosis complex (167 outbreaks) and intestinal coccidiosis (162 outbreaks) were the most common diseases reported generally throughout the State by Poultry Branch officers. In addition to these, there are distinct area problems. In North Queensland, the officers stationed at Townsville and Atherton reported 153 cases of botulism and 110 cases of eyeworm (*Oxyspirura mansoni*). It is of interest to note that eyeworm is now becoming rather prevalent in the Ipswich district and that odd cases occur in the Brisbane area.

The respiratory complex, particularly coryza and chronic respiratory disease (C.R.D.), are now often found on farms. The use of streptomycin sulphate by intramuscular injection at the rate of 100 milligrams per bird, or the feeding of the antibiotics terramycin or aureomycin at 100 grams to the ton of feed, has given satisfactory results in flocks affected with C.R.D.

Sixty cases of bluecomb, which is double the number reported for 1955-56, occurred during the year, 36 outbreaks occurring from January to March 1957. In most cases, the death rate was not high. Furazolidone is not yet available for general use, but the use of chlortetracycline ("Aureomycin") in the drinking water has generally given a rapid and favourable response in terms of reduced mortality and increased production during treatment.

Pullorum Testing.—It is pleasing to report that not a single reactor was removed from 60 per cent. of the flocks of stock-suppliers registered with the Department. The total percentage reaction for the State is now only .15.

Table 4 illustrates the progress which has been made in reducing the incidence of pullorum in breeding flocks.

TABLE 4.

PULLORUM-TESTING STATISTICS, 1954–1957.

—	1954–55.	1955–56.	1956–57.
Total number of fowls tested	246,532	227,773	226,571
Number tested for registered stock suppliers	207,360	223,302	224,689
Number of registered stock suppliers' flocks tested	139	137	139
Number of flocks—no reaction at test	46	57	84
Percentage reaction for State	·32	·28	·15

Stickfast Flea.—The stickfast flea is now fairly widespread in Queensland. It was found on 71 of 266 properties surveyed in the Cribb Island area in December. Outbreaks have also been reported on the Darling Downs and at Longreach and Barcaldine during the past 12 months. These places are in addition to its known distribution in Townsville, Lucinda Point, Beachmere, Charleville, and the Boonah district.

Action was taken by the Poultry and Veterinary Services Branches to treat all dogs, cats and poultry on infected properties at Cribb Island. This has been of some value, for a recent visit to Cribb Island showed that all poultry were free from flea, though there was a moderate infestation of other animals. However, with such a closely settled area with few fences and with a weekend influx of picknickers, it is difficult to see how the flea can be eradicated from this area and its spread to other places prevented.

POULTRY STOCK SUPPLIERS.

During the year, 194 registrations as stock suppliers were made under "*The Poultry Industry Acts*, 1946 *to* 1950," compared with 204 in the previous year. There were 15 cancellations for the business of hatching chickens for sale, and four for supplying fowl eggs for hatching. Nine new registrations were made for the business of poultry dealing.

PRODUCTION OF DAY-OLD CHICKENS.

The number of chickens sexed in 1956 was an all-time record, the total number being 3,240,648. This is an increase of more than 12 per cent. on 1955 hatchings. Doubtless this increased chick production has had a considerable influence on the production of eggs during the year under review.

POULTRY MEAT PRODUCTION.

As will be seen from Table 5, the total number of poultry slaughtered in the Brisbane area shows only a slight increase on 1955-56.

TABLE 5.

POULTRY SLAUGHTERINGS AT ABATTOIRS IN BRISBANE AREA, 1953-1957.

Years.	Cockerels (Chickens).	Hens (Boilers).	Total Slaughtered.
1952–53 ..	206,101	328,315	613,844
1953–54 ..	240,049	311,444	604,725
1954–55 ..	137,118	346,417	512,438
1955–56 ..	316,991	381,561	734,952
1956–57 ..	348,922	400,105	779,090

The rapid expansion in cockerel raising resulted in over-supply towards November and December of 1956 and prices fell by as much as 1s. per lb. liveweight for this class of poultry. As a result, fewer cockerels are now being raised.

Prices up to 1s. 10d. per lb. liveweight were being paid for hens until December 1956, when a recession took place. The average price for hen meat at present is approximately 1s. 2d. per lb. liveweight.

POULTRY ADVISORY BOARD.

This Board met on two occasions. The business dealt with included the programme of experimental work to be conducted by the Branch, Poultry Branch estimates (including the precept to be issued on marketing boards), egg quality and proposed amendments to legislation.

STAFF TRAINING.

Finance from C.E.S.G. funds enabled two officers of this section to attend a special course in Poultry Science at Melbourne University from January to March, 1957.

BIOCHEMICAL BRANCH.

Dr. J. M. Harvey, Biochemist.

This Branch at present has two main functions. The first is to provide a diagnostic service designed principally to assist field officers scattered throughout the State. The second is to initiate or collaborate in a number of investigational projects on problems related to the livestock industry in this State.

The diagnostic service is maintained in close association with the Veterinary Pathology Section at the Animal Research Institute. It includes biochemical analyses of specimens submitted where field or clinical evidence suggests nutritional disorders in livestock, and toxicological analyses on both plant and animal specimens where extraneous poisons are suspected. An additional service is provided by the analyses of fluids from dipping vats charged with various preparations used in the control of external parasites of livestock, the object being to ensure economic maintenance of effective vat strength.

Investigational projects in the biochemical field are carried out mainly in liaison with animal or crop husbandry Branches.

The past year has seen the initiation of studies on both crop and grass silage. Five test silos of ½ ton capacity have been installed. In January three of these silos were filled to examine the influence of additives such as sodium metabisulphite and molasses on silage made from paspalum pasture. Temperature records have been kept. It is proposed to open these silos in July, when tests of yield, quality, stock food value and digestibility will be made. The remaining two silos have been used to examine the value of adding urea to sorghum as it is ensiled.

A work of considerable importance is the assessment of the feeding value of sorghum silage, of which there are some 100,000 tons conserved in pits in western Queensland. The first step was to develop a technique for the preservation of silage during transportation to the laboratory from pits distant more than 1,000 miles. This was achieved by the use of plastic bags, containing about 60 lb. of silage, filled and sealed under an atmosphere of nitrogen. Digestibility trials have been made on two lots of sorghum silage from two locations and the analytical data when complete should yield valuable information on the amount and type of supplementation that may be necessary to maintain sheep on this conserved fodder in times of drought.

Another field of investigation which has been developed in the past year is concerned with the chemical and physical characteristics of certain DDT preparations in use in dipping vats. Work is in progress to attempt to correlate these characteristics with biological efficiency in the control of cattle ticks.

TOXICOLOGY SECTION.

Diagnostic Service.

Specimens were received from 240 cases where poisoning of livestock was suspected. Analysis confirmed arsenical poisoning in 32 cases, lead poisoning in six, phosphorus in three and strychnine and creosote each in one case. The high proportion of positive findings due to arsenic is in keeping with experience in previous years and in most instances is due to careless disposal of arsenical weedicides or dipping fluids.

In the previous report mention was made of the confirmation of selenosis in horses in the Cape York Peninsula. It was incorrectly stated that this was the first demonstration of naturally occurring selenosis outside the North American continent; it has also been recorded in Ireland.

A further incidence of selenosis has been confirmed in north-western Queensland. Both plant material and hoofs of affected horses showed levels of selenium consistent with those recorded in cases of "alkali" disease in U.S.A. The plants incriminated are species of *Neptunia* and *Sesbania*. The selenium concentration in these plants suggests a selenium toxicity problem similar to that found in the Cape York area, viz., a high selenium level in seasonal herbage plants resulting in an intermittent exposure of livestock to a high concentration of selenium.

There has been a rapid build-up in the number of samples submitted from dipping vats located throughout the State. Of the 443 samples submitted, 129 were arsenical preparations and the remainder chlorinated hydrocarbons. It was readily apparent that if chemical analysis was to ensure the economic maintenance of the tickicide at effective strength there was an urgent need for comprehensive instructions on maintenance, stirring and sampling of vats charged with chlorinated hydrocarbons. This has been done and the Veterinary Services Branch has designed and distributed a satisfactory sampling tool.

Investigations.

Further data have been collected on the selenium toxicity problem in the Cape York Peninsula. Only one plant, *Morinda reticulata*, has been incriminated. The concentration of selenium varies with stage of growth. In November, samples taken from one plant showed selenium levels on a dry matter basis of 1,141 parts per million in young leaf, 422 in green mature leaf, 151 in old mature leaf and 610 in root. Selenium in soil samples from this locality was less than 0.2 p.p.m. except in surface soils rich in organic debris and taken from the immediate surroundings of Morinda plants. The plant has a massive rooting system and apparently a marked capacity to accumulate selenium. Feeding trials made by officers of the Research Branch at the Animal Health Station, Oonoonba, produced clinical symptoms in horses, and analysis of blood, organs, hair and hoof showed selenium concentrations consistent with those recorded in cases of alkali disease.

The incidence of selenosis in the north-western locality was confirmed in April 1957 and plans for further investigation are being formulated.

Work on the chemistry of the toxic principles in poison plants was restricted to preliminary trials on the toxicity of seeds from *Castanospernum australe* (Moreton Bay chestnut) and pods of *Acacia georgina* (gidyea). The testing of extracts for toxicity is being done in collaboration with the Veterinary Pathology Branch. Much detailed work has been devoted to the development of a suitable technique for testing toxicity, as this is vital to the elucidation of the toxic principle.

A number of DDT preparations in use in dipping vats are being examined, the characteristics under consideration being crystalline structure and concentration of effective isomer, settling rate, degree of stripping by cattle and the persistence of effective isomer on the hair of cattle under both stalled and grazing conditions. It is now proposed to expand these studies to include biological efficiency in the control of cattle ticks.

BIOCHEMISTRY SECTION.

Diagnostic Service.

Data from diagnostic samples received during 1956-57 have been used to plot the distribution of phosphate and copper deficiency in ruminants in Queensland. The findings are tabulated in Table 1 in districts; they show the number of properties in which livestock have been found adequate, marginal or deficient in either phosphate or copper.

TABLE 1.

DISTRIBUTION OF PHOSPHATE AND COPPER DEFICIENCY IN RUMINANTS.

District.	Phosphate.			Copper.		
	Adequate.	Marginal.	Deficient.	Adequate.	Marginal.	Deficient.
Moreton	40	19	8	27	16	11
Wide Bay	20	10	7	16	3	6
Port Curtis	7	4	..	4	4	9
Burnett	9	5	6	11	4	2
Darling Downs	8	2	2	5	..	..
Maranoa	..	..	3	..	..	..
Leichhardt	5	5	6	1	..	..
North Kennedy	6	7	2	2	1	..
Cook	6	4	1	12	..	..
	101	56	35	78	28	28

Liver vitamin A levels confirmed the field and pathological diagnosis of vitamin A deficiency in fowls from five properties. A marginal vitamin A status was indicated on a further six poultry farms. Vitamin A deficiency was found in ducklings on two occasions. Liver anlayses supported the diagnosis of vitamin A deficiency in pigs from two farms and indicated a marginal vitamin A status on a further two properties. A limited number of analyses of blood or liver samples from sheep and cattle showed an adequate vitamin A status on all occasions.

In suspected cases of milk fever in cows, the analysis of serum confirmed hypocalcaemia on two dairy farms and hypomagnesaemia on a further two occasions.

Some 800 miscellaneous samples were examined. These included pasture, silage, hay and stock feeds to determine feeding value. Other determinations were made in connection with certain specific disorders in livestock and included analysis for carotene, thiamin, riboflavin, manganese, molybdenum, inorganic sulphate, fluorine, nitrate, oxalate, serum protein, blood haemoglobin and bilirubin.

Investigations.

Phosphate.—The Branch is associated with field trials by husbandry Branches to measure production responses in cattle from supplementation with phosphate in some areas where a deficiency has been diagnosed. Three methods of supplementation are being used—topdressing with superphosphate, treatment of drinking water with superphosphate or sodium phosphate, and bonemeal licks. All are long-term trials. In one locality there has been a response in the growth rate of beef cattle in supplemented groups, together with an increase in the blood inorganic phosphate status. In another area there has been no measurable response from topdressing with superphosphate at the rate of 187 lb./acre/annum, and heavier rates of fertilizer are being applied.

Data are being obtained from a number of dairy properties to examine the correlation of phosphate levels in faeces with the phosphate status of the diet of grazing cattle. There are indications that the analyses of grab samples of faeces from a representative number of animals can provide valuable information on the nutritional status of the herd.

Copper.—The 3-year copper supplementation trial with sheep in north-western Queensland has been completed and the data are being assembled for publication. The essential findings are the desirability of building up a good copper reserve in the animal; the need for supplementation at 3-monthly intervals to maintain this reserve; and no response in lambing performance or the growth rate of either lambs or weaners in supplemented groups but a marked response in wool quality and quantity.

A long-term copper supplementation trial with beef cattle on the Near North Coast was continued. Some of the data have been presented for publication. In this locality topdressing at least at 6-monthly intervals is necessary to ensure an adequate copper status in grazing cattle. There has been no marked response in the growth rate of young stock on topdressed pasture. This has been attributed to the predominance of narrow-leaf carpet grass, which has a low nutritive value. Ploughing, fertilizing and resowing gave a most satisfactory mixed legume and grass pasture and grazing cattle showed spectacular weight gains. Less severe measures of pasture renovation and topdressing with superphosphate encouraged clover growth for several months, during which stock showed satisfactory weight gains. Present indications are that growth responses are not being maintained in cattle with the onset of winter.

Three copper metabolism studies are in progress at the Rocklea Husbandry Farm based on earlier observations which established that there is biochemical evidence of copper deficiency in cattle grazing these pastures.

The first was designed to study the utilization of copper by both sheep and cattle grazing a predominantly paspalum pasture. In 1955-56 lambing ewes showed a marked fall in liver copper reserves. This did not occur in 1956-57, when both dry and pregnant ewes maintained an adequate copper status. In both years Hereford cows grazing the same pasture showed very low copper reserves which were not affected by the onset of pregnancy. Liver biopsy samples were taken from the calves at birth and all showed high concentrations of copper in spite of the low copper status in their dams.

The second trial is to examine factors in the diet which interfere with copper metabolism by ruminants, in particular molybdenum in the presence of inorganic sulphate. Repetitive sampling and analyses of pasture have shown a satisfactory copper status, a low concentration of molybdenum, and high levels of inorganic sulphate. Initial studies with rations moderately high in molybdenum and inorganic sulphate indicate that copper metabolism is similarly affected in sheep and cattle. The influence of lower concentration of molybdenum equivalent to those in the pasture are now being examined.

The third trial is essentially a pasture management trial. Two matched groups of Hereford heifers have been selected. The performance of one group on set stocking is being compared with the group which is rotated at weekly intervals between four paddocks. An equal number of animals in each group has been maintained copper adequate by intravenous copper therapy. No conclusions may be drawn at this stage.

Vitamin A.—The study of the effect of vitamin A deficiency in the diet of laying fowls has been completed and a paper presented for publication. Essential findings are that egg production and hatchability are affected before there is clinical evidence of deficiency; that chemical analysis of liver will establish vitamin A deficiency several weeks before clinical symptoms are apparent; that hatchability is reduced to zero with the onset of clinical symptoms; that there is an immediate response in both egg production and hatchability after vitamin A supplementation to deficient fowls; and that the mortality rate is high in chickens hatched from vitamin A deficient eggs but that these losses can be minimised by a chick starter ration rich in vitamin A.

A 2-year survey of the carotene and vitamin A content of butterfat in 12 dairying districts has been completed. There is no evidence of vitamin A deficiency, but seasonal and breed variations are apparent. The data will be published.

Digestibility.—Studies have been largely restricted to paspalum pasture, hay and silage, and to sorghum silage from a locality near Brisbane and two areas in the north-western portion of the State. Conclusions cannot be drawn at this stage. Feed intake assessment trials using chromic oxide as a marker are also in progress.

DIVISION OF DAIRYING: BRANCH REPORTS.

FIELD SERVICES BRANCH.

Mr. F. C. Coleman, Director of Field Services.

With the exception of the Atherton Tableland and the nearby coastal area, weather conditions in the dairying districts were very similar. Good rains had fallen during May and June, but comparatively dry conditions then continued until December, when good rains fell. These were followed in January and February by useful, though below-average, rains. Dry conditions were experienced thereafter and gradually became worse until drought conditions were almost general in June.

BUTTER PRODUCTION.

Production of butter for the year was 41,089 tons. This amount is 7,100 less than last year's total.

The percentage of butter officially graded as choice quality was 34.27, compared with 38.21 in the previous year. Thus, the unsatisfactory position continues and reflects a lack of concern on the part of the industry. The percentages during the past four years are as follows:—29.81, 36.79, 38.21, and 34.27.

Quality was detrimentally affected because continuous dry weather depleted tank water supplies, resulting in imperfect cleansing of dairy equipment, and because cream deliveries to factories were reduced to two per week in many areas. The inability of field officers to visit suppliers as frequently as desirable delayed checks on quality decline.

Weed exacted its usual toll of first and second grade cream during the winter months.

The 51 butter factories remain in sound structural condition. Last year's report mentioned the installation of the second of a new type of pasteuriser. This is the Cream Treatment Unit, one of which is installed at the Booval factory of the Queensland Farmers' Co-operative Association and one at the Maleny Co-operative Association's factory. This pasteuriser employs a system of counter-current steam flow with cream as distinct from the con-current steam flow employed in the more widely used vacreator. Both factories employing this type of pasteuriser have obtained satisfactory results. During the year one factory installed an insulated metal churn, and three others are contemplating doing so. The condition of equipment in butter factories is, generally, sound. Approximately £141,827 has been spent during the year on new equipment and renovation of buildings.

Ten special factory surveys were conducted by the Field Services Dairy Technologist to overcome chemical taints, low Butter Quality Index results, and processing and manufacturing defects in butter. In addition, special investigations were continued in conjunction with the Dairy Research Branch.

CHEESE PRODUCTION.

Production of cheese for the year was 7,137 tons, which was 7,580 tons less than the quantity manufactured in 1955-56. Although there were quite a number of diversions of suppliers from butter to cheese factories this year, cheese production was lower due to the adverse seasonal conditions and the milk supplies drawn from cheese factories to maintain market milk supplies to Brisbane and other towns.

There was a heartening improvement in the quality of cheese, and this could be attributed to a number of factors. Firstly, the manufacture of cheese with a lower moisture content played an important part in this respect. Price incentives for milk of high standard paid by those factories engaged in both cheese manufacture and the market milk trade also contributed to the improved results. The extension efforts of the field staff assisted in the general improvement of quality; and cheesemakers, conscious of the unstable overseas market, made greater efforts to make a better quality cheese. But for the dry seasonal conditions and depletion of tank water supplies, the cheese quality results would undoubtedly have been even better.

The manufacture of Edam cheese was an innovation by one factory; it offers possibilities of increasing cheese sales. The automatic assembling and nailing of cheese crates will no doubt be adopted by other factories following the installation of a machine for this purpose by one association. A number of factories commenced the sale of prepacked cheddar cheese in rindless form during the year. This attractive presentation should assist in increasing consumption of cheese.

Regulations were inserted in the Dairy Produce Act prescribing that milk supplies to cheese factories shall be graded by sensory test and the methylene blue test and at least 2d. per lb. butterfat more shall be paid for first grade than for second grade milk.

The regulations governing the marking of cheese were also amended to provide for coloured waxes to be placed on semi-mellow and matured cheeses to enable their ready identification by consumers.

Linthorpe cheese factory was closed during the year, leaving 27 cheese factories in operation. Alterations are being made to the Woodford factory of the Caboolture Co-operative Dairy Association to enable cheese to be manufactured there. The structural condition of all factories is satisfactory. An amount of £40,785 was spent on new equipment and renovations.

MARKET MILK PRODUCTION.

Production of market milk was maintained at a satisfactory level during the year. Owing to the abnormally dry conditions prevailing from March to June, many cream suppliers were diverted to milk supply to enable liquid milk requirements to be met; thus there has been no shortage of market milk in any area of the State.

The standard of dairy premises and equipment of milk producers continues to improve. The number of milk storage refrigerators has shown an increase; 75 per cent. of producers forwarding milk direct to Brisbane factories now have them installed.

All bulk milk from country factories is chilled and transported to Brisbane in insulated road tankers. In North Queensland the first rail tanker for pasteurised bulk milk was put into operation during the year, transporting milk from Malanda to Townsville.

The operations of one large Brisbane milk pasteurisation factory were transferred to a new modern section, in which equipment for automatic handling has been installed. A new milk pasteurisation factory is being erected at Rockhampton to replace the existing building, which has become inadequate for the increased trade. Structural improvements and installation of modern equipment have been effected at several other milk pasteurisation factories.

Plate 1.—Automation in a Pasteurised Milk Factory.

Equipment for the pasteurisation of milk was installed at Gladstone during the year, making it possible to further extend the benefits of the School Milk Scheme. Most of the eligible children in Queensland are now participating in the scheme.

The consumption of milk in the Brisbane area continues to increase and has reached approximately 18,000,000 gallons yearly. The amount of table cream consumed in Brisbane for the year was approximately 115,000 gallons, which represents less than a quart per person per annum.

The price paid to producers was increased during the year. The summer period return is now 3s. 4d. per gallon and the winter price 3s. 8d. per gallon in Brisbane. Prices in other cities vary slightly from the Brisbane prices. The summer payment for market milk in Brisbane is equivalent to 8s. 6d. per lb. butterfat at the average fat content of 3.8 per cent. and the winter payment is equivalent to 9s. 4d. The return to producers in country centres is reduced by handling charges incurred in treatment and despatch.

Expenditure on new premises, equipment, etc., totalled £320,000.

DAIRY PREMISES AND EQUIPMENT.

Hygiene.

Hygiene was improved to some extent by the use of much new equipment, a growing appreciation of the acid-alkali method of cleansing milking machines, and the increasing use of recirculation or in-line cleansing equipment.

Structural Conditions.

Many dairymen have shown a growing inclination to erect better, more efficient and more comfortable dairy premises. The activity in building noted last year was continued, and many officers report the erection of spacious, solidly constructed buildings with good finish and appearance. Some of these have cost between £1,500 and £2,000. This interest has prompted a number of firms to manufacture ready-to-erect metal sheds and these are now gaining in popularity. In addition to being easily assembled by the farmer himself, they are more hygienic than wooden buildings. The use of two sets of teatcups, instead of a single set, in each double bail is extending. This is being done by farmers with a view to reducing shed building costs as it enables the herd to be milked in a smaller milking shed. It is felt that many owners have been induced to erect better premises as a result of having seen good types at field days, tours and method demonstrations. The number of new premises erected was 529, compared with 595 last year, whilst 466 premises were renovated, compared with 547.

The "Herringbone" Milking Shed.

Much interest has been shown by Queensland farmers in the "herringbone" milking shed which is gaining in popularity in New Zealand. It is claimed that in this type of shed one man can handle 6-8 sets of teat cups and thus milk 70-90 cows per hour. This promised such a marked improvement on Queensland methods that two dairy-farmers decided to construct dairy premises to the "herringbone" design. The completed buildings have now been in use for some months and the claims made have been proved to be substantially correct.

The "herringbone" shed consists of two elevated, parallel platforms, separated by a sunken milker's alley, the floor of which is approximately 30 in. below the concrete platforms, on which the cows stand in echelon or angle parking formation (Plate 2). Within the restricted space of the alleyway the operator has no great distance to move when attending to the individual cows. The distance between udders is approximately 3 ft., so the milker is always close to his cows—he is virtually amongst them and can observe simultaneously the complete line of cows being milked. One advantage of this arrangement is that the constant stooping by the milker which is associated with the walk-through shed is eliminated. Milking is thus less arduous, working conditions provided are more comfortable and time is saved. Another advantage is that in an area no greater than that of the walk-through type, a greater number of cows can be accommodated at the one time, thus permitting a greater number of teat cups to be used, with consequent reduction in total milking time. Several other of these buildings are now under construction in various parts of the State.

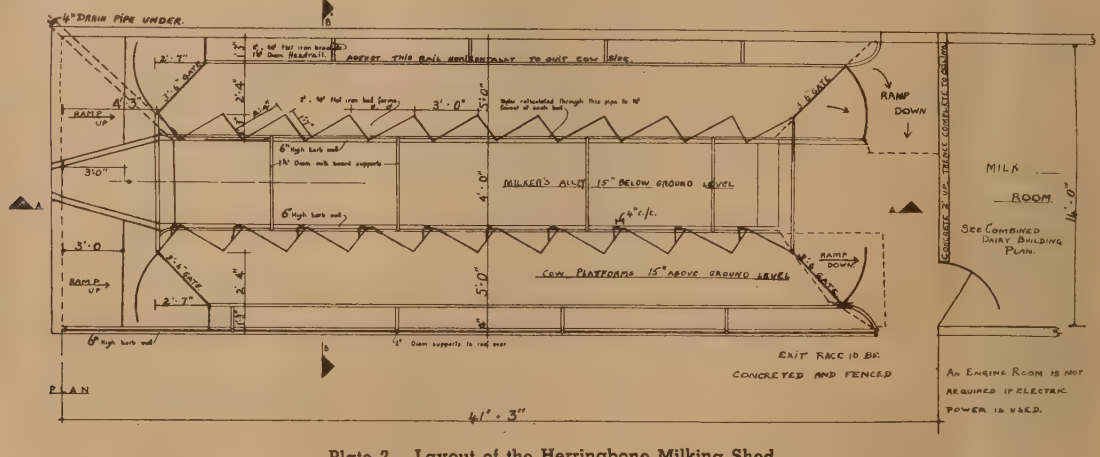

4" DRAIN PIPE UNDER.
ADJUST THIS BAIL HORIZONTALLY TO SUIT COW SIZES.
RAMP UP
RAMP DOWN
6" high kerb and
MILKER'S ALLEY 15" BELOW GROUND LEVEL
COW PLATFORMS 15" ABOVE GROUND LEVEL
MILK ROOM
SEE COMBINED DAIRY BUILDING PLAN.
EXIT RACE TO BE CONCRETED AND FENCED
AN ENGINE ROOM IS NOT REQUIRED IF ELECTRIC POWER IS USED.
PLAN
41'-3"

Plate 2.—Layout of the Herringbone Milking Shed.

Hot Water Facilities.

As a result of the extension of electrification in rural areas in recent months there has been a marked tendency to install electric hot-water units at dairy sheds in place of fuel water-heaters. There are also some districts awaiting electrification, so the growing use of electric heaters promises to continue. There has been an increase of approximately 5 per cent. in installations of approved hot-water appliances and some districts report almost complete compliance with desirable requirements in this respect.

Machine Stripping.

There is evidence that machine stripping is increasing. Farmers are becoming more conscious of the benefits of the practice, although many still appear to be dubious. Officers in some districts report that 5-7 per cent. of farmers are practising it, whilst others state that 30-40 per cent. are doing so.

In-line Cleansing.

Although used by only a small percentage of farmers, in-line cleansing of milking machines is steadily gaining in popularity. Officers agree that if this equipment is properly used a big improvement in cleanliness results.

Cooling of Milk and Cream.

An encouraging feature this year has been the increased number of farm refrigerators installed. It is gratifying that farmers are becoming increasingly convinced of the value and necessity of refrigeration under the warm climatic conditions of this State. The majority of installations are on market milk supply farms, but many cream suppliers have also installed farm refrigerators. There are now 1,691 refrigerators in use in Queensland, compared with 1,456 last year.

Three American in-the-tank cream refrigerators undergoing trials on demonstration farms under the

Commonwealth Dairy Industry Extension Grant are operating effectively. This type offers promise of providing a cheaper unit than the types at present used in Queensland. Thirty-three cream tower coolers have now been erected under the Commonwealth Dairy Industry Extension Grant and results to date are encouraging. These reduce cream temperatures to within 5 deg. F. of wet bulb temperatures and although not as efficient as refrigerators are a useful alternative for the farmer who cannot afford a refrigerator.

In order to provide a water cooling tower with lower initial cost, a Divisional officer designed a new type of metal tower (Plate 3). One is now in use and a district Co-operative Association is arranging to manufacture these units, having been convinced that their use will improve milk quality.

The general progress made in regard to milk and cream cooling has been encouraging.

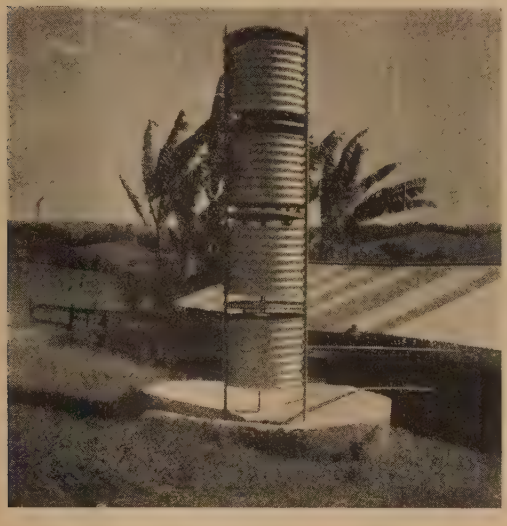


Plate 3.—A New Type of Milk Cooler.

Milking Machines.

There has been a further development of the milking machine testing service this year. During 1955-56 only 10 sets of Ruakura air flow meters and vacuum recorders were available. These were provided by the Queensland Dairymen's Organisation for the use of staff of co-operative dairy associations. The staff of only two associations, however, have been trained in the use of this equipment. Additional sets were purchased during the year by the Queensland Dairymen's Organisation and a number of associations also purchased sets. The number now available is 30, all of which are operated by officers of this Division. Twelve hundred tests of milking machines have now been carried out; the results will be analysed during the coming year to determine the major defects causing inefficient operation. Farmers in every district speak enthusiastically of this service, which, incidentally, has also been responsible for fostering a better relationship between the Dairy Officer and the farmer.

Whilst officers are able to check the efficiency of machines and effect adjustments to improve faults, major repairs cannot be carried out by them. This is a drawback which co-operative associations themselves will need to overcome. One leading Brisbane machinery firm is providing its own mobile servicing unit.

Following last year's report on the removal of milkstone, recommendations were made by the Dairy Research Branch for the use of the hydrochloric acid method of removal. These recommendations enabled the field staff to hold method demonstrations, which have convinced farmers that removal of milkstone can be done with safety and with comparative ease.

FODDER CONSERVATION AND PASTURES.

The year under review has been an unsatisfactory one so far as the conservation of fodder is concerned. Fodder reserves on most dairy farms are quite inadequate to combat drought.

Dairy-farmers are becoming more interested in pasture improvement each year. There is a marked trend towards pasture improvement, and greater acreages of improved pastures would have been planted during the year had weather conditions been more favourable. It is pleasing to see this trend and it is felt that demonstrations under the Commonwealth Dairy Industry Extension Grant and success stories have played an important part in developing it.

SEASONAL CALVING.

There is evidence that the practice of seasonal calving is gaining in popularity. It has been ascertained that 40 per cent. of herd-recording members have adopted the practice. This subject has been featured at the Annual Herd Recording Meetings during the year. It will be gradually adopted by increasing numbers as herd sterility problems are overcome; diseases affecting breeding are widespread among Queensland dairy herds. The subject is widely discussed amongst dairymen, most of whom appear to be convinced that if the practice is successfully carried out, milk and butterfat production per cow can be increased. So far, only a small percentage of farmers have provided a bull paddock, an essential for controlled matings, and the neighbour's roaming bull is still a problem.

EXTENSION WORK.

Illustrated Talks.

The following sets of coloured slides are now in use by officers, who use them mainly in talks to Queensland Dairymen's Organisation branches:—Dairy Hygiene and Dairy Premises (33 slides); Milking Machine Care and Maintenance (30 slides); Cheese Milk Production (21 slides), Herd Recording (55 slides), Cooling of Milk and Cream (34 slides). Most officers are now proficient in the use of the camera and have added many coloured slides of local interest to their collections; it is these which farmers particularly appreciate. A good response to these talks has been noted in most areas and their increasing use will be energetically pursued. Illustrated talks to dairymen have become an important feature of the Divisional extension programme, as it is felt that they induce a good officer-farmer relationship and stimulate action by informal discussion.

Film Nights.

There is an increasing demand by farmers for film screenings. A number of Australian films dealing with dairying are now being made and they should, when available, contribute materially to the work of extension. Several film nights were held during the year, with good attendances. At the request of the Maryborough Show Society, programmes of Departmental films were shown by the Senior Adviser. Approximately 1,000 people attended the screenings.

It is believed that the various subjects handled at illustrated talks and film evenings have expanded the outlook of the farmer in search of improved farm practices. Most officers appear to be interested in the greater use of films as an extension medium.

Method Demonstrations.

The method demonstration has proved to be effective in teaching farmers skills. It was used to good advantage during the year in demonstrating the removal of milkstone from milking machines. These deposits are responsible for high thermoduric counts in milk. Many farmers attending the demonstrations were subsequently successful in removing the milkstone and thus obtained milk with a lower bacterial count. In addition to milkstone removal, the care and maintenance of milking machines and the use of the Ruakura air-flow meter and vacuum recorder were featured at 48 method demonstrations. Because of the success of this extension medium it is proposed to use it extensively in the future.

Conducted Tours.

These have lost none of their popularity. Ten tours were organised; they were attended by approximately 2,000 people. There have been numerous expressions of appreciation regarding the demonstrations seen and the friendly atmosphere existing on these tours. If the farmer can be made to feel at home, the best environment in which to demonstrate a method or result is created. More conducted tours were contemplated but could not be proceeded with as the dry conditions became steadily worse.

Plate 4.—Farmers Examine Modern Dairy Premises on a Conducted Tour.

Junior Farmers.

Fifty-four talks were given to Junior Farmer Clubs. Officers have assisted with Club activities and have acted in an advisory capacity. Invitations are issued to members of Junior Farmers Clubs to attend conducted tours, field days, illustrated talks and film evenings. Officers, generally, are impressed by the standard of agricultural education in most Clubs. An endeavour will be made to collaborate even more closely and effectively with the Junior Farmers' Organisation in future.

Journal, Press and Radio.

There has been a noticeable increase in the number of press releases prepared by officers, indicating that, when unable to travel, officers used the time to good effect by writing. Local papers, generally, proved most co-operative in the publication of news items. They sought success stories accompanied by photos and a number of these were prepared featuring the top members of herd recording groups. The following were prepared by officers:—14 articles for the *Queensland Agricultural Journal*, 4 A.B.C. Country Hour Talks, 21 radio tapes for country radio circulation, 52 Press releases, 15 news bulletin items and 8 Ministerial press releases. The total was 114, compared with 58 last year.

With regional power extending, more farmers are installing radio sets in their dairy premises. This trend will later provide a good means of conveying advice and information to the farmer whilst at work.

Photography.

Officers are making good use of Departmental and private cameras. Apart from the full sets of coloured transparencies prepared at Head Office for the use of district officers, these officers have augmented the sets with many photographs of local subjects. Head Office has a library of 900 slides. Officers undergoing induction and in-service training are taught the use of the camera.

Discussion Groups.

Farmers have shown an interest in the formation of discussion groups. Members hold informal meetings at regular intervals and invite Departmental officers to give talks and to take part in the subsequent discussions. Some groups have been formed as a result of interest created at annual herd recording meetings. There are approximately 10 groups in the Warwick district which meet to discuss herd recording, milking machine efficiency, cooling of dairy produce, pasture improvement, fodder conservation, etc. A group at Gympie, in which Departmental Officers collaborate closely with officers of Nestle's Food Specialities, is proving effective. In this district, officers consider that discussion groups are the most useful type of extension medium. Additional groups are in the process of being formed and are being assisted by Officers.

Dairy Extension Advisory Committees.

The primary function of these committees is to further Departmental—industry organisation liaison and extension activities. The major objective is the fostering of recommended farming practices, particularly those practices proven by farmers under the particular district soil and climatic conditions. The success achieved by the three Committees at Oakey, Gympie and Malanda has led to action for the formation of additional committees in the ensuing year.

Summary of Extension Work.

The extension work of the Branch is summarised as follows:—87 Illustrated Talks (Q.D.O. Branches), attendance 2,284; 19 Field Days, 1,669; 48 Method Demonstrations, 453; 18 Annual Herd Recording Meetings, 592; 30 Film Nights, 1,000; 54 Junior Farmer Club Meetings, 819; 10 Conducted Tours, 2,000; 10 Calf Clubs, 107; 5 D.E.A.C. Tours, 490; Total 281 meetings, attendance 9,413.

Dairy displays organised at Toowoomba and Warwick attracted large attendances.

Herd Recording Extension.

The practice of holding annual meetings or field days for members of herd recording groups was continued. This year the need for keeping adequate herd records was the major theme. Officers of the Herd Recording Section supplied material to field officers and also attended a number of these meetings.

Field officers prepared articles on the successful practices adopted by the owners of the highest producing herds in their districts. These articles are being printed in the local press and in the *Queensland Agricultural Journal*.

Farm Demonstrations.

Work on farm demonstrations under the Commonwealth Dairy Industry Extension Grant proceeded along similar lines to those of last year. However, pasture demonstrations received a severe setback due to drought conditions during the greater part of the year. Associated with the drought conditions were faults in management due to underwatering of irrigated pastures and over-grazing of most pastures. The sowing down of several new pasture areas had to be deferred until next year due to lack of rain.

It is unfortunate that pasture improvement projects should have received such a severe setback, as many farmers have become interested as a result of the demonstrations. During the past four years there has been a 12½ per cent. increase in the area sown to improved pastures in the main dairying districts compared with the previous four years.

Due to the setback of pastures, only 10 field days were held on demonstration farms. Attendances averaged 120 people. Ten conducted tours were held on which one or more demonstration farms were visited. Average attendance was 200.

An analysis of the projects is as follows:—

Rain-grown pasture	92
Irrigated pasture	23
Strip grazing	4
Fodder conservation	10
Gully reclamation	1
Milk and cream cooling	52
Milk composition feeding demonstrations	8
Detergents and recirculation cleansing	27
Solar water heater	1
	218

The last four types of demonstrations are described in the report of the Dairy Research Branch.

Once again an attractive exhibit was displayed at the Brisbane Royal National Exhibition. The exhibit stressed the salient points in the care and maintenance of milking machines. In addition, a small-scale exhibit on methods of cooling milk and cream was prepared for display at country shows.

The "Newsletter" went out bi-monthly to all co-operators, supervising officers, and Queensland Dairymen's Organisation secretaries. Prominence is given to write-ups of successful demonstrations and items of general dairy interest.

PURE BRED PRODUCTION RECORDING.

The policy in respect to Pure Bred Production Recording has been to increase progressively the number of cows to be recorded until such time as the whole of the herd is submitted. This year breeders were required to submit all cows under the age of five years at calving.

During the year, cows from 119 herds were recorded, compared with 143 herds in 1955-56. The number of herds recorded in each breed was as follows:—A.I.S., 49; Ayrshire, 6; Friesian, 7; Guernsey, 8; Jersey, 49.

The number of cows which completed a lactation period was 2,047, compared with 1,913 in 1955-56. The number of cows which produced the age production standards required to qualify for entry into the Advanced Register of the various Herd Books was 93.9. The percentage of cows (41.8) was less than in 1955-56, when 50.0 per cent. qualified.

Withdrawals of cows from recording for various reasons totalled 201 (8.9 per cent.), compared with 179 (8.5 per cent.) in 1955-56. The main cause was the withdrawal of herds owing to adverse seasonal conditions.

The average production according to breed of cows which completed lactations of 300 days or less is shown in Table 1.

TABLE 1.

AVERAGE PRODUCTION OF PURE BRED COWS, ACCORDING TO BREED.

Breed.	No. of Cows.	Average Production.		
		Milk	Test.	Butterfat.
		Lb.	%	Lb.
A.I.S.	867	7,373	4·1	303
Ayrshire	95	7,082	4·2	298
Friesian	47	8,226	3·5	288
Guernsey	110	6,034	4·7	285
Jersey	928	5,208	5·3	276
Total	2,047	6,324	4·6	289

The seventh Annual Report on Pure Bred Recording was distributed to dairymen. Appreciation of the report has been expressed by many commercial dairymen, as well as by studbreeders.

During 1956-57, seven cows qualified for entry into the Lifetime section of the Register of Merit, the same number as in the previous year, and 51 for the Intermediate section, compared with 37 in 1955-56.

The composition of the Register is given according to breed in Table 2.

TABLE 2.

COMPOSITION OF REGISTER OF MERIT FOR DAIRY COWS ACCORDING TO BREED.

Breed.	Section of Register.		
	Elite.	Lifetime.	Intermediate.
A.I.S.	4	14	78
Ayrshire	..	2	9
Friesian	..	1	..
Guernsey	..	1	11
Jersey	1	22	128
Total	5	40	226

RECORDING OF GOATS.

This is the second year that the recording of goats has been carried out; the number of herds increased from three to seven. The average production of the 35 goats which completed a lactation was 1,184 lb. milk, 48 lb. butterfat. The average butterfat content was 4.0 per cent.

GROUP HERD RECORDING.

The information supplied by herd recording assists the dairy-farmer in his culling, breeding and feeding programmes and allows him to assess the value of his various farming operations. A progressive Atherton Tableland farmer has shown an increase in production of 91 per cent. in eight years of recording. The average production of his herd increased from 182 lb. butterfat in 1948-49 to 348 lb. in 1955-56.

With examples such as this, it is surprising that a much greater number of herds are not recorded. At present approximately 7 per cent. of the herds in Queensland are submitted, compared with 25-50 per cent. in the major dairying countries of the world. Avenues are being explored to induce more farmers to record their herds.

The adverse seasonal conditions affected the expansion of the scheme. During the year six new Herd Recording Groups were formed, and five were closed owing to herds withdrawing due to dry conditions. Herds from the closed groups were transferred to other groups to maintain the strength of membership and keep down costs. Eighty groups were operating at the end of the year. Costs continue to rise and the fee payable by the farmer was increased to 8s. 6d. per cow per lactation on July 1, 1956.

The staffing of groups continued to be a problem. During the year 29 recorders resigned. A recent increase in wage of 7s. 6d. per week granted by the Industrial Court may help to retain them in future.

During the Group Herd Recording year, which ended on Sept. 30, 1956, 54,352 cows from 1,412 herds completed lactation periods. The 1954-55 figures were 45,734 cows in 1,266 herds. The average production of

the cows was 356 gallons milk and 155 lb. butterfat, an increase of 8 gallons milk and 5 lb. butterfat over the previous year. Group herd recording has been operating for nine years in this State and the annual average production of recorded cows has risen from 144 lb. butterfat in 1948-49 to 155 lb. in 1955-56. Increase has been limited by the large number of new herds entering the scheme each year. The results of a survey of the effect of continuous recording last year showed that the average of herds recorded for seven years or more was 182 lb. butterfat.

During the year the recording system was changed to provide the recording farmer with a monthly progressive production total for each cow. This enables him to readily ascertain the period each cow has been milking and her production since calving. He thus knows her production as soon as she is dry and can decide whether or not to retain her in the herd. The issuing of progressive production totals was made possible by the acquisition of new calculating equipment through the Commonwealth Dairy Industry Extension Grant.

Calf Identification.

Herd recorders have continued the work of tattooing heifer calves in grade herds in order to give the farmer a positive identification of his animals when they come into profit. More farmers should realise the value of this service. During the year 8,355 heifer calves in 751 herds were tattooed, compared with 9,470 calves in 728 herds in 1955-56.

Sire Surveying.

During the year applications were received from 35 members of herd recording groups for surveys of their sires, compared with 60 in the previous year. An analysis showed that 43 per cent. of the bulls were increasing the production of the herd, 32 per cent. maintaining the level of production and 25 per cent. lowering the production. It is expected that, as a result of extension work during the year, there will be an appreciable increase in the number of applications next year.

Herd Records.

The quality and quantity of records kept by dairy farmers with respect to their herds leave much to be desired. This paucity of records not only hinders the farmer's planning of a breeding programme, but also retards the surveying of various phases of herd management. In order to improve the records kept by members of herd recording groups, a concentrated drive has been made to encourage the keeping of records. An article dealing with the subject has been distributed to all group members. Addresses on the keeping of records, supplemented by appropriate transparencies, have been featured at annual Herd Recording Meetings. A supply of suitable simple shed sheets has been printed for distribution to recording farmers. It is hoped that this will result in more information being available to the owners and to the Department.

"Recording Notes."

In order to provide a continuous flow of information to farmers, a monthly publication termed "Recording Notes" has been commenced. This publication contains topical information regarding herd recording activities as well as succinct notes on animal husbandry and general dairy farming practices.

Surveys.

Mastitis.—Information on the prevalence of mastitis, its treatment and the results of such treatment was collected for 12 months in a limited number of purebred herds.

Calf Rearing Practices and Calf Wastage.—Data have been collected for 12 months and are being collated.

Period Between Calvings.—A survey conducted on 19,971 cows showed that the majority of cows calved at periods of 11 and 12 months. The production was adversely affected if they recalved at a shorter period, but was not improved by a longer dry period between calvings. The results are given in Table 3.

TABLE 3.

Effect of Calving Interval on Production.

Period Months.	Percentage of Cows Calving.	Average Production Butterfat.
		Lb.
9	1·8	158
10	17·6	160
11	25·5	175
12	28·3	171
13	10·2	170
14	6·2	169
15	3·2	178
16 or more	7·2	170

Length of Dry Period.—A survey of 20,487 cows showed that 25 per cent. of cows had a rest period prior to calving of 1–7 weeks, 45 per cent. had 8–12 weeks, and 40 per cent. a longer period. No increased production was obtained by lengthy spells in the dry paddock. It would appear that the treatment the cow receives prior to calving may be more important than the length of the dry period.

Factors Affecting Level of Production.—This survey is being conducted in conjunction with the Cattle Husbandry Branch and the Queensland Dairymen's Organisation. A trial survey is being restricted to herds in the herd recording groups on the Atherton Tableland, where there is an active Dairy Extension Advisory Committee.

SUMMARY OF FIELD STATISTICS.

The advisory work carried out by officers of the Division and the Brisbane Milk Board is summarised in Tables 4 and 5.

TABLE 4.

Summary of Field Statistics, 1956–57.

Districts.	Farm Visits.	Factory Visits.			Suppliers Tests.	Factory Tests.
		Butter.	Cheese.	Milk.		
Brisbane	1,588	187	..	176	752	387
Brisbane (milk quality control)	1,480	..	5	235	13,704	341
Darling Downs (Toowoomba)	3,744	238	66	42	17,767	850
Darling Downs (Warwick)	1,224	143	138	150	10,590	5,801
Rockhampton	1,960	202	..	76	5,695	784
Maryborough	1,956	205	16	108	1,752	529
Murgon	1,277	215	40	12	171	..
Gympie	1,776	223	20	114	1,632	724
Northern	869	43	..	99	5,048	195
Ipswich	1,580	162	..	49	1,639	43
Total	17,454	1,618	285	1,061	58,750	9,654

TABLE 5.

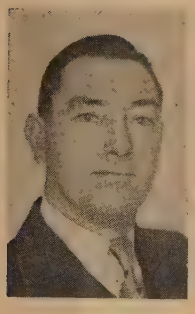
Brisbane Milk Board Suppliers and Factory Visits.

——	Farm Visits.	Factory Visits.
Milk Board Officers	1,869	1,039
Divisional Officers	2,665	634
	4,534	1,673

There were 20 successful prosecutions under Section 20 of the Dairy Produce Acts (sale of milk which is not pure milk). A total of 354 orders was issued, compared with 474 last year. These covered temporary closure of unsatisfactory dairy premises, the erection of new premises or renovation of old ones, the cleansing forthwith of premises where hygiene was poor, and cooling of milk or cream.

DAIRY RESEARCH BRANCH.

Mr. L. E. Nichols, Director of Research.



The Branch has continued its research activities into problems affecting the quality of milk and milk products, and its routine laboratory quality improvement services. Results of the work performed have been passed on to officers of the Field Services Branch, for application on farms and in factories.

A higher incidence of chemical and bacteriological defects in dairy products and farm and factory water supplies caused a considerable increase in the overall number of samples examined. This was due mainly to dry weather conditions.

The dairying industry has taken full advantage of the regional laboratories established at Toowoomba, Murgon and Malanda, as shown by the many requests for advice and the number of samples received at these centres. These units have facilitated on-the-spot investigations in important dairying areas of the State and encouraged the flow of technical information to extension officers and industry alike.

With the transfer of the Hamilton laboratory to the Butter Marketing Board's new premises, the work of the Butter Improvement Service has been facilitated and butter investigations have been extended.

Overseas purchasers have become more selective in regard to the chemical and bacteriological quality of dairy produce and this development has led to an intensification of the field and laboratory control services, particularly with respect to extraneous matter and bacterial content.

The bacteriological laboratories of the Branch were examined and approved by the National Association of Testing Authorities in the Field of Biological Testing.

Two officers resigned during the year to take up service with other organisations. The loss of six male officers in recent years has made it increasingly difficult to maintain the desired service to industry and adequate staffing of the regional laboratories.

The laboratories have aided the training of a number of Colombo plan students, as well as providing induction training for new Dairy Officers of the Division.

INVESTIGATIONS.

Investigations have covered a wide range of problems, including the keeping quality, flavour, composition and yields of dairy produce, better utilization and improved presentation. Wherever possible, the work has been directed towards improved efficiency and economy in production and processing.

Keeping Quality of Pasteurised Milk.

Considerable importance is placed on the keeping quality of market milk and it is noteworthy that in some overseas countries a keeping quality test has been introduced for pasteurised milk in place of the plate count. In Queensland, a keeping quality test based on that now used officially in England has been applied as an advisory test by this Branch for several years, and its usefulness under semi-tropical conditions has been closely observed. During last year this test was the subject of much investigation. To enable the work to be undertaken, a series of specially designed water-baths operating at close temperature differentials had to be constructed (Plate 1). This apparatus has permitted the conduct of the keeping quality test at temperatures ranging from 16 deg. to 26 deg. C. and over various storage periods.

The results of the investigation have shown that the time and temperature of storage of the samples prior to conducting the methylene blue test have a profound influence on the test result. Consequently, it would seem necessary to define precisely the conditions of storage. It would appear that a storage temperature within a range of 18-20 deg. C. would give the most satisfactory storage conditions.

In addition to the methylene blue test, all milks have been examined by taste and smell after storage and this has afforded a check on the ½-hour standard employed in the test. Many milks giving reduction

Plate 1.—Apparatus for Determining the Keeping Quality of Milk.

times in excess of ½ hour possessed bad flavours at the end of the storage period and this result suggests that the standard of ½ hour may have to be raised to 1½ hours.

Further work is proceeding in regard to the effect of bacterial types on the keeping quality standard.

Table Cream.

Table cream is not a major dairy product in this State, but it has some importance and offers an alternative means of disposal of butterfat on the local market.

Although the local consumption of cream is small, representing 5-6 per cent. of the fat consumed as liquid milk, there is room for considerable expansion in the consumption of such a product. Only one type of fresh cream having a fat content not less than 35 per cent. is supplied at present. There is little doubt that should creams of a lower fat content be made available, their lower price would encourage the consumption of table cream. A light cream with a fat content of 18-25 per cent. would sell at little more than half the price of the present richer type. Cream with an even lower fat content (9-12 per cent.) should also be considered.

As a human food, cream is quite as perishable as milk and to attain suitable quality standards it must be properly processed and handled. However, there are no processing or bacteriological standards for the control of this product. Consequently, in association with the Health Department, investigations have been carried out with a view to formulating suitable processing, bacteriological and keeping quality standards.

Suitable temperatures for the high-temperature short-time pasteurisation of cream have been determined and 172 deg. F. would appear to be the optimum. Above this temperature cream tends to acquire a cooked flavour and "thickening" and "bitterness" develop, due to the action of spore-forming bacteria which survive the pasteurisation treatment.

The Aschaffenburg-Mullen phosphatase test proved suitable for testing the efficiency of pasteurisation of cream and was quite reliable provided the cream was tested soon after pasteurisation. Reactivation of phosphatase, however, occurred in some samples after storage.

Temperatures below 40 deg. F. were found necessary for the storage of cream if defects were to be avoided.

It has not yet been possible to devise a suitable keeping quality test for pasteurised cream, but the methylene blue and resazurin tests are under consideration.

Recombined Milk.

The recent establishment of reconstituted milk plants in South-East Asia places Queensland, because of its proximity to these countries, in a favourable position for supplying the basic ingredients.

The work this year has been concerned mainly with attempts to produce reconstituted milk with a flavour more closely resembling that of pasteurised milk. In this regard, several additives were tried. These included 0.07 per cent. sodium chloride and 1.5 per cent. of a culture (*S. diacetylis*) in the reconstituted skim-milk powder and butteroil. The acidity of the mixture was allowed to reach 0.15 per cent. lactic acid before pasteurisation. Quite a distinctive, attractive flavour resulted as compared with the controls.

Although the slightly acid reconstituted milk possessed a better flavour, difficulties in applying the technique of starter propagation in tropical countries and extra cost of the equipment may militate against its application. Lactic acid was tried as an alternative, but failed to give the desired flavour. Similarly, no improvement resulted from intensive aeration of the reconstituted products. In a further trial, 10 per cent. of buttermilk powder was incorporated with the skim-milk powder, butteroil and salt. The resulting product was superior in flavour to any previous batches. Other additives have yet to be tried in an effort to enhance the flavour of the product.

Reconstituted Cream.

Trials have been conducted in the reconstitution of table cream from skim-milk powder, butteroil and water. The aim has been to assist in the provision of an additional outlet for butterfat and to enable table cream to be prepared during periods when all supplies of liquid milk are required for the milk trade.

The best results were obtained by using a proportion of buttermilk powder, together with the skim-milk powder and butteroil. No benefit could be obtained by the use of traces of salt or by the addition of starter or lactic acid. Sodium citrate was found to improve the viscosity of the product.

It was shown that the butteroil contributed markedly to the powdery flavour of early batches, even though the butteroil was freshly made. The work so far suggests that the flavour of fresh cream is intimately bound up with the fat-globule membrane, which is destroyed in the processing of the butteroil. Further work with fat-globule membrane substances is to be undertaken with a view to enhancing the flavour of reconstituted cream.

Milk Composition Feeding Trials.

The trials this year have provided more evidence of the effect of the type of feed on the yield and composition of milk.

In Queensland, there is a seasonal effect on milk composition during the late winter and early spring which makes it difficult for some producers to supply milk of legal compositional quality. Cheese yields are also reduced at times, and manufacturing faults occur in cheese-making unless modifications in processing are applied.

Work to date has shown that milk supplied from herds fed on lucerne–green panic pasture is superior in compositional quality to the milk from those fed on sorghum and Sudan grass and paspalum and Rhodes grass. In several districts, the lucerne–green panic pasture has not only arrested the seasonal decline in milk composition, but has raised the total solids percentage of the herd milk by 0.3 per cent. The greater part of this increase is accounted for by an increase of 0.2 per cent. in the solids-not-fat content.

The daily feeding of 5 oz. of sterilized bonemeal with a trace of potassium sulphate to suitably paired groups of cows in one herd in a sub-coastal area raised the fat and solids-not-fat percentage of milk slightly, increased overall milk yield, and extended the lactation period of the experimentally fed group of cows. In another herd, increased milk production occurred without a decline in the milk solids content. An attempt is being made to substantiate this trend by the use of identical twins. The project is being continued in association with the Cattle Husbandry and Agriculture Branches.

Extraneous Matter in Butter.

In recent years, increasing importance has been placed on the presence of extraneous matter in dairy products and official tests have been inaugurated by Commonwealth and State authorities. Considerable quantities of butter were rejected from export because of extraneous matter. Consequently, surveys and investigations were initiated to find the cause and, if possible, to rectify the fault. The work suggested that cream supplies, wash water and salt used in butter-making were the principal sources of this type of contamination.

Cream has not been subjected previously to cloth filtration in Queensland factories and a number of difficulties were anticipated. Cold cream would not filter and the Nap filter wads normally used soon became fat saturated and blocked. In preliminary trials it was decided to apply filtration of the heated, pasteurised cream at a temperature of 130 deg. F. prior to cooling. However, an unexpected difficulty was encountered from particles of casein scale which flake off the walls of the vacreator and tend to block the filter.

With the co-operation of the Butter Marketing Board an American circular 4-plate milk filter was purchased and modified for the treatment of cream (Plate 2). It was found that, of numerous filtering materials tried, nylon and voile material gave the best results and the longest runs without changes. The nylon filters were readily cleaned and sterilized and were reusable. Voile was not quite so adaptable. Already two filtering devices for cream, using nylon cloths, are receiving attention; so is the process of clarification.

Plate 2.—A Cream Filter in Operation at a Butter Factory.

The work has shown that cream can be successfully filtered and the way has been shown for commercial firms to manufacture suitable equipment.

Keeping Quality of Butter.

The prolonged cold storage to which export butter is subjected makes it necessary for butter of good keeping quality to be manufactured. In this regard, there is room for improvement in some Queensland butter.

Of 156 churnings examined from a representative cross-section of factories, 27 per cent. were degraded before storage and 28 per cent. of the remainder were degraded after three months' storage. As a result, efforts have been made to ascertain some of the factors responsible.

The effect of pH of the butter serum has been examined. Salted butters in the more alkaline range (pH 7.8-8.2) have shown a better keeping quality. Differences as great as three points were recorded; they occurred from one month after storage up to a period of six months. No correlation between pH and bacterial development after storage was evident. Significant increases, however, were noted in the fat content of the buttermilk. The work has been prepared for publication.

In contrast to the results obtained with salted butter, the keeping quality of unsalted butter has been appreciably improved by raising cream acidities in neutralisation to 0.15 per cent. with a pH range of 6.8-7.0 in the resultant butter.

It is known that contamination with copper and iron is detrimental to the keeping quality of butter, and already there is evidence to show that such metallic contamination from corrosion in cold water storage tanks and cream equipment has affected some consignments. Other factors receiving attention are the more intensive systems of cream pasteurisation and butter storage temperatures.

Cultured Cream for Butter Manufacture.

There is a fairly constant demand for good quality unsalted butter on the local market. There is also a steady demand for unsalted or low salt butter overseas and such butter usually commands a premium price. In the case of unsalted butter, the market has tended to request a butter of more pronounced flavour. Consequently, an attempt has been made to produce experimentally a butter which possesses an abundance of flavour and which could be tried to test local consumer opinion.

A highly flavoured butter was produced by culturing the cream with flavour-producing starter cultures, but keeping quality was poor. However, the fat percentage in the buttermilk from ripened cream was less than half that of normally treated cream. Improved results were obtained when cream ripening acidities were reduced.

The trials to date have shown that the flavour of local butter may be improved by careful cream culturing and it is now possible to set out a procedure for factory guidance.

Decay in Butter Churns.

Rapidly decaying wooden butter churns constitute one of the most important sources of bacterial contamination of butter leading to low bacteriological quality indices. Attempts have been made to reduce decay by treating the exterior of new-churn wood with appropriate fungicides. However, after two years fungal rot has occurred in all the experimentally treated churns. Other alternatives are now being considered in association with the C.S.I.R.O. A contributing cause of churn wood decay has been found to be the inclusion of sapwood timber.

It is now intended to try the effect of a water-dispersible polystyrene coating on the internal surfaces of some new churns. The possibility of using fungus-resistant timbers is also being examined in association with the Forestry Department.

In the meantime, tests conducted in collaboration with the Field Services Branch with a new stainless steel churn barrel have given satisfactory results and an extension of the use of such barrels can be predicted.

Steam Utilization.

Steam-metering devices have been installed in three butter factories with a view to determining the relative steam economies of three different systems of cream pasteurisation. One system already recorded shows an average steam consumption of 3 lb. per gallon of cream treated. Although the system is efficient, steam consumption is considered high.

Fat Balances.

Fat losses in buttermaking represent a considerable economic loss to the dairying industry. Studies are being made at one factory on the estimation of fat-balances, and already the value of gravimetric as compared with volumetric methods for fat determinations in cream have been confirmed.

Flavour Chemistry of Dairy Products.

Little is known of the chemical make-up of flavour in dairy products, and an attempt is being made to determine constituents which might be responsible. With the aid of paper chromatography and electrophoresis techniques, a study is being made of the various proteins, fats and sugars which could play a part. The beta-lactoglobulins have been patterned and their relationship to breed is being established.

The changes in cheese ripening have also been recorded and 14 water-soluble amino-acids chromatogrammed. Of these, arginine and methionine have shown a close relationship to bitter flavours of cheese. Histidine also appears to be associated with undesirable flavours.

With multiple chromatography, a number of sugars in milk, including lactose, glucose and galactose, have been isolated. The work opens up a fresh field in a simplified study of the various complex constituents of dairy products.

The techniques will afford an opportunity of examining the effect on dairy products of the intensive high temperature systems of pasteurisation of dairy products now widely practised in Queensland, as well as of breed, feed and storage of milk, butter and cheese.

Phage Resistant Medium (PRM).

Preliminary tests have been carried out in the laboratory and at cheese factories with a new medium (produced by an English company) for the preparation of cheese starter. This medium has been developed in order to protect starter cultures from phage attack. Unfortunately, the results obtained have not entirely substantiated the claims made, but the pH of the PRM was lower (6.2) than that stated by the manufacturer (6.8). It thus seems the material may have been affected in transit or storage in semi-tropical conditions.

In factory trials, it was found that PRM was not easy to reconstitute in bulk, and special equipment would be required on a factory scale. Not all starter cultures grew in PRM and the rotations of cultures normally used in factories would be curtailed. It was also noted that phage did not die out in these cultures as claimed. Most vat failures in Queensland are due to phage contamination in the cheese vat, and the use of PRM cultures thus may not provide a safeguard in such instances. However, the advantages claimed for the product may still facilitate starter culture propagation and help overcome failures in bulk starters. Suitability of the product under factory condtiions has, however, to be more thoroughly examined, particularly in relation to costs, suitable water supplies for diluent and convenience in use. It is hoped that a fresh consignment of the PRM will indicate whether any change takes place during transport and storage.

Coliforms in Cheese.

Some preliminary work has been done on coliforms in cheddar cheese and the numbers and types occurring. Samples of cheese 14-21 days old were obtained from cold stores and examined bacteriologically for total count, yeasts, moulds and coliform organisms. Isolates of coliforms were classified. In most cases, only one type of organism was isolated from each cheese, but, in a few instances, two types were found. It appears from the results to date that there may be a correlation between the numbers of coliforms and the grade points of the cheese, up to three weeks of age. Whilst four types of coliform organisms were isolated, the predominant type of coliform appearing in Queensland cheddar cheese after two to three weeks is *E. coli* type I. This work indicates that greater attention must be paid to hygiene if cheese defects due to excessive coliform development are to be eliminated.

Inhibitory Cheese Milk.

In the past few years, attention has been given to so-called inhibitory winter milk supplies to cheese factories, a condition retarding acid production of starters in cheese manufacture other than that due to phage. In Queensland, where the New Zealand vitality test for starter cultures has been used as a means of gauging acid production, no general incidence of inhibitory milk has been noticed. Inhibitory milk, however, has been observed, mainly during the winter months and only when the activity test for starters has been used.

Experimental work done in Queensland has shown that, while some milks are inhibitory to some starter strains and not to others, the phenomenon disappears when a vitality test, in which the milk is clotted with rennet, is used. It has also been shown that the vitality test correlates well with actual vat workings, though the activity test does not. The work has been extended to study the effect of rennetting. The exact nature of the inhibitory principle in milk still remains to be demonstrated; so does the precise path of its effect. Two papers have been prepared for publication.

Composition of Cheese and Quality.

There is considerable room for improvement in the quality of cheese to meet the increasing competition and demands of overseas markets.

With a view to examining experimentally the effect of the moisture content of cheese on its quality, several trials have been conducted at two Queensland factories.

Using both single and mixed strain starter cultures, cheese was made with normal and low moisture contents. One cheese from each vat was analysed immediately after pressing and graded after three weeks, with the following results:—

Description of Cheese.	Number of Vats.	Average Moisture.	* M.F.F.S.	Grade.	Average Points Score.			
					Flavour.	Body.	Texture.	Colour.
		Per cent.	Per cent.					
Normal	10	36·79	55·41	89·8	40·6	3·2	3·1	2·9
Low moisture Single strain .. Low moisture Mixed strain ..	20	34·89	53·22	91·1	41·5	4·05	3·75	4·3

* M.F.F.S. is the moisture in the fat-free substance of cheese.

In a further trial, "high" and "low" moisture cheese (difference of approximately 1.0–1.5% moisture) graded as follows:—

Type of Cheese.	Number of Vats.	Average Grade Points Scored.				
		Total.	Flavour.	Body.	Texture.	Colour.
"High" moisture	35	90·3	40·9	3·9	3·4	4·0
"Low" moisture	35	91·1	41·5	4·3	3·5	4·3

There was a general tendency for the cheese with the lowest moisture content to score the highest number of grade points. There was, however, no significant difference due to mixed or single strain cultures.

The ratio of moisture to solids-not-fat in cheddar cheese largely governs the biological reactions in the cheese and is thus more closely related to quality than either the fat percentage or the moisture percentage alone. Consequently, the optimum and maximum ratios are now being examined.

Cheese Yields.

Further work on this project has established distinct seasonal trends in cheese yields directly related to variations in the composition of the milk. It has also been shown that the type of summer crop grown is largely responsible for the marked decline in yields over certain summer months. Experimental work is now proceeding on six farms to establish which crops can effect improvement Already there is some evidence to show that a lucerne–green panic pasture can raise the casein percentage of milk to the extent of 0.3 per cent. over that usual on sorghum and Sudan grass. However, corroborative data are required. Two papers have been prepared for publication.

Cheese Waxing.

With the increasing popularity and higher price for waxed cheese overseas, attention has been given to better types of cheese waxes and their composition, age of cheese for waxing and conditions of storage. The value of waxing in reducing surface defects of cheese and loss of weight has been demonstrated. Trials with different cheese wax blends showed marked differences in their ultimate quality. It has been shown that a blend containing micro-crystalline paraffin and petrolatum in suitable proportions has superior qualities but is a little more costly.

Provided a clean, dry rind is formed, waxing is more successful if the cheese is stored at a relative humidity of not more than 83 per cent. and a temperature of 55 deg. F.

Marking Cheddar Cheese.

At the request of the Queensland Cheese Marketing Board and the Commissioner for Prices, efforts were made to determine a more suitable method of marking semi-mellow and matured cheddar cheese.

The water-soluble marking inks previously used were not entirely satisfactory for the purpose, and the use of spirit-soluble types was shown to be more effective. A number of water-soluble and oil-soluble dyes incorporated in wax were tried for the purpose of developing coloured waxes. The water-soluble preparations were again generally unsatisfactory. However, with the use of certain oil-soluble dyes, it was possible to compound suitably coloured waxes which could be applied to cheese to enable consumers to recognise the type of cheese they are buying.

Cheese Packaging.

Trials with three different types of cheese packaging materials were continued. Two of these proved satisfactory, but the other was unsatisfactory because of excessive mould development, due to the greater permeability of the material to air. Occasional gas production and moulding with one of the materials was examined. Improved clip-sealing and enlargement of the package to overcome seam faults reduced the mould infestation. Gas development in some packages still presents a problem.

Efforts are now being made to package export cheese, but faults in clipping due to the larger size have yet to be overcome. The effect of storage temperatures on the texture of prepackaged cheese is also being examined.

Other Cheese Investigations.

The application of a time-saving method of cheddar cheesemaking was further examined, and the trial production of non-cheddar cheese types was continued. In an endeavour to increase the variety of cheese manufactured locally, efforts have been mainly concentrated on the production of Dutch type cheese, such as Edam and Gouda. This type seem more likely to be successfully manufactured under local conditions than the "blue mould" variety.

LABORATORY SERVICES.

The laboratory quality improvement services for market milk, butter and cheese have been continued in association with officers of the Field Services Branch, the results of analyses forming the basis for field follow-up.

Over 300 visits were made to milk, cheese and butter factories for the purpose of conducting bacteriological surveys, checking efficiency of factory processing or doing investigational work.

Market Milk.

Details of the samples examined in connection with the control of market milk and table cream, and the comparative figures for the preceding year, are set out below:—

SUMMARY OF MILK AND TABLE CREAM EXAMINATIONS.

—	1955–56.	1956–57.
Bottled pasteurised milk—		
Plate counts (number)	1,742	2,272
Coliform tests (10 ml. and 1 ml. levels)	3,169	4,138
Phosphatase tests—		
Number	1,551	1,952
Percentage negative	99·94	99·84
Keeping quality tests—		
Number	..	856
Percentage of failures	..	3·80
Fat tests—		
Number	1,831	2,320
Average percentage of fat	3·90	3·80
Solids-not-fat tests—		
Number	1,463	2,180
Average percentage of solids-not-fat	8·58	8·56
Microscopic examinations	5,287	4,440
Raw milk at depots—		
Methylene blue tests—		
Number	361,559	347,562
Percentage below 4 hours	6·24	4·9
Fat tests—		
Number	103,924	109,014
Percentage below 3·3	2·84	3·1
Bulk milks from country depots—		
Methylene blue tests	6,363	5,679
Fat tests	5,284	5,680
Bulk tanker samples tested in laboratory—		
Methylene blue tests	366	672
Fat tests	372	700
Raw milk produced for vendors—		
Methylene blue tests	654	507
Fat tests	633	512
Bottled pasteurised cream—		
Plate counts	98	372
Coliform tests	108	375
Phosphatase tests—		
Number	113	378
Percentage negative	79·6	88·3
Fat tests—		
Number	115	393
Average percentage of fat	37·4	37·3
Factory surveys	64	66
Thermoduric counts on raw milk—		
Number	390	3,190
Total number of tests	495,022	493,192

Raw Milk Quality.—The number of methylene blue tests performed at processing depots and country receiving depots has been well maintained. The percentage of samples failing this test (4.9) is noticeably lower than in the previous year (6.2), showing that most of the raw milk supplied has been of good bacteriological quality as judged by this test. Microscopic examinations of all low-quality milks have been made in the laboratory, and the results of these tests, the probable causes of low quality, and advice on remedial action have been sent to the suppliers. The percentage of milks failing to reach the standard of 3.3 per cent. fat was 3.1, which is slightly higher than in the previous year (2.8%).

The testing of samples of bulk tanker milk has been intensified, there being a tenfold increase in the number of samples over the previous year. These samples have been examined for methylene blue reduction time, fat, milk solids and freezing point. It is to be expected that the number of such samples will continue to rise as the proportion of tanker milk brought in continues to increase.

Regular sampling and testing of raw milk produced for vendors has continued. These samples have been examined by the methylene blue test and for fat, and microscopic examinations have been made of all milks of low bacteriological quality.

Freezing Point Determinations.—The examination of milks for adulteration was stepped-up during the year. Over 2,500 previously screened samples were submitted for analysis and freezing point determination.

Testing for Thermoduric Bacteria.—Over recent years the count of heat-resistant organisms in bottled pasteurised milks in this State has caused some concern. This count actually increased in spite of the fact that the bacteriological quality of the raw milk received, as judged by the methylene blue test, has improved year by year. Earlier work has shown that such high counts originate from production conditions on farms, where dairymen adjust their methods of hygiene to suit the method of quality control applied through the methylene blue test. Thus in a great many cases the standard of cleansing and sterilizing of milk equipment is just sufficiently good to destroy the heat-susceptible, strongly-active bacterial types and leave untouched the more resistant, weakly active species. These develop in large numbers on milk deposits, give rise to very high counts in the raw milk, and survive pasteurisation to persist in the final bottled product.

Control measures applied in the second half of the year have been aimed at locating by testing those farms supplying high count milk, and effecting a reduction in the counts through advice to farmers by letter and by advisory visits by field officers.

So far, more than 3,000 samples have been taken. After laboratory pasteurisation, the thermoduric count has been determined by the roll-tube method, using commercial equipment designed for the purpose. After advice as to methods of control, milk from unsatisfactory suppliers is retested. In some respects, the results obtained by these methods have been most encouraging and at one large depot the percentage of high-count milks has been reduced from 47 to 4 within a period of four months. However, to maintain control it seems necessary to introduce a routine test for thermoduric bacteria at milk receiving depots. Consequently, efforts are being made to evolve methods and equipment (Plate 3) for regular factory testing of each raw milk supply.

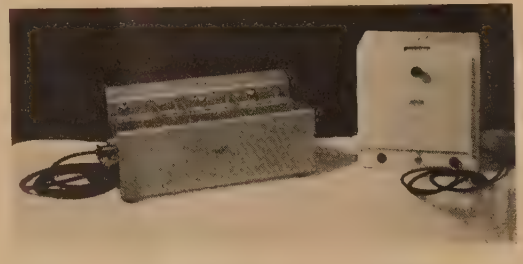


Plate 3.—Apparatus for Determining Thermoduric Bacteria in Raw Milk Supplies.

Pasteurised Milk Quality.—The primary test for pasteurisation efficiency is the phosphatase test, and it is significant that practically all such tests were satisfactory. This result indicates a very high standard of processing at all depots.

An intensification of the work aimed at lowering the count of thermoduric organisms in raw milk supplies has had a valuable effect in reducing the bacterial counts of pasteurised milk. This work must be continued, however, to effect a further improvement and prevent counts from climbing again. The keeping quality of bottled pasteurised milk has improved during the year and only 3.8 per cent. of samples failed the keeping quality test. This is lower than during the previous year, when 6 per cent. failed. The principal causes of failure are variability in the quality of the raw milk and some post-pasteurisation contamination.

Presumptive coliform tests have been carried out at the 10 ml. and 1 ml. levels, the 10 ml. test being used solely as an advisory test to warn factories of traces of contamination not revealed by the official 1 ml. test.

All pasteurised milk samples have been examined for fat content, total solids and solids-not-fat. The average fat content was 3.80 per cent. and the average content of solids-not-fat was 8.56 per cent. These averages are slightly below those for the preceding year.

As in previous years, samples of pasteurised milk received from immigration authorities and defence forces have been tested on behalf of the Commonwealth Government. A total of 66 such samples was received during the year and examined for total bacterial count, *E. coli*, keeping quality, phosphatase, added water, butterfat, and milk solids. A high standard of quality of such milk has been maintained.

During the year 66 surveys of milk pasteurising plants were made to check their efficiency and to keep the quality of the pasteurised milk at the highest possible level.

Samples of homogenised, clarified, and sterilized milk were examined chemically and bacteriologically.

Pasteurised Cream Quality.—The routine laboratory examination of pasteurised table cream has continued in an endeavour to improve the quality of the product and to assist in formulating suitable standards for its quality control.

Cheese.

A total of 758 cheese starter cultures was distributed during the year, mainly from the Toowoomba laboratory, where the maintenance and investigational work on starter cultures is based.

Freeze-dried starter cultures as received from the C.S.I.R.O. have also been kept on hand. The use of the freeze-drying technique for the preservation of starter cultures in an unaltered form over long periods has been found satisfactory and the technique does obviate some of the tedious work involved in frequent purification and maintenance of activity. However, most factories still prefer liquid cultures because of convenience, reduced lag in preliminary propagation and reduction in subculturing hazards.

Circulars which contain up-to-date information on cheese starters generally and in particular on starter cross relationships, rotations in use, bacteriophage incidence and strain compatibilities, have been distributed to all cheese factories and appropriate Departmental officers.

Sediment in Cheese.—The testing of cheese for extraneous matter has shown the need for filtration of cheese-milk. A bag type of cloth filter has been tried and found useful and economical.

Butter.

Examination of butter samples under the Butter Improvement Service was continued to provide information for control and advisory purposes. A total of 25,471 tests on 2,851 samples was performed.

Routine Control.—Moisture and salt determinations were carried out on 2,052 samples of butter; only 11 were overmoisture. The average chemical composition was:—moisture 15.61 per cent., salt 1.30 per cent., curd 1.03 per cent., fat 82.06 per cent. The average serum pH reading of 7.66 from a total of 1,094 samples compares favourably with the previous year's figure (7.65).

An average Bacteriological Quality Index of 227 was obtained from the examination of 2,047 butter samples. This average figure is far below the desired objective of 400, and indicates the need for a greater appreciation of the bacteriological quality of butter by the industry.

The standard of working, as judged by the microscopic appearance of the size and distribution of the water droplets in the butter, continues to be good. The following are the results of examination of 2,044 samples:—

—	Well Worked.	Fairly Well Worked.	Rather Under-worked.	Under-worked.	Very Under-worked.
Number of tests	1,512	220	71	161	80
Percentage of total	73·9	10·8	3·5	7·9	3·9

The extraneous matter test has been continued as a routine examination and 1,937 butters were examined, with the following results:—

—	Clean.	Fairly Clean.	Dirty	Very Dirty.
Number of tests ..	453	1,289	169	26
Percentage of total..	23·4	66·6	8·7	1·3

The number of butters (totalling 10 per cent.) which failed to reach a satisfactory standard is still somewhat high, but is a marked improvement on results of the previous year, when 18 per cent. of butters failed to reach the desired standard.

Chemical.

A total of 7,587 samples, including brines, butters, cheese, cream, detergents, margarine, powdered milks, salt and waters, was submitted for examination. The analysis of these samples involved 14,000 individual tests. Where samples did not conform to the desired standards of composition, advice on remedial measures was given.

Because of the wide variations recorded in butter moistures between factory and laboratory tests, an attempt is being made to study some of the factors which are critical, particularly the effect of differences in humidity.

Drought conditions prevailing in the State resulted in a sharp increase in the flow of farm water samples for analyses. Farmers were informed how to treat the waters to make them suitable for dairy and general purposes. Seventeen factories experiencing trouble with refrigeration brines forwarded samples for analysis. More rigid control of the pH of brines is needed in a number of factories.

Milk and butter factory managements seem to be becoming more conscious of the necessity of controlling detergent strengths in canwashers and bottle-washing machines. It does not seem to be widely recognised that bottle-washing machines depend for their efficiency largely upon the concentration of alkali present.

A total of 12,998 pieces of glassware was submitted for testing. This represents an increase of 1,000 on the previous year. The percentage condemned was 5.9, compared with 9.8 in the previous year.

QUALITY IMPROVEMENT DEMONSTRATIONS.

From funds made available from the Commonwealth Dairy Industry Extension Grant, demonstrations have continued with a view to improving the quality of milk and cream.

Improved Dairy Detergents.

Queensland's hard and variable quality water supplies constitute a danger to the quality of dairy produce and add to the difficulties of effectively cleaning dairy equipment. To overcome milkstone deposits and high counts of thermoduric bacteria in milk and cream supplies, farmers must become more selective in their choice of dairy detergents. This year, demonstrations on 18 farms were confined to three systems of alkali-acid cleaning, in an endeavour to find the most efficient, cheapest and least corrosive. The three methods applied were:—

(1) The New Zealand alkali-citric acid method.

(2) Sodium metasilicate and wetting agent used daily, with phosphoric acid once weekly.

(3) Sodium metasilicate and wetting agent used daily, with dilute hydrochloric acid once weekly.

All methods were applied with and without recirculation through milking machines. The sodium metasilicate-hydrochloric acid method stands out to date as the most effective and cheapest for the majority of Queensland hard water supplies and average conditions of use.

The removal of milkstone deposits is facilitated by increasing the concentration of hydrochloric acid. The method has also enabled very low plate count milk to be produced on hitherto very difficult farms. Two articles have been published on this work.

Solar Water Heater for Dairy Use.

Queensland is ideally situated with respect to the amount of sunlight available for heating. Dwindling wood supplies in some districts and high costs of electric power have suggested the need for demonstrating alternative sources of heat for dairying purposes. An attempt has therefore been made to develop a solar water heater (Plate 4) suitable for use on dairy farms. The

normal solar heater used for household purposes has been somewhat modified to obtain the highest temperatures possible for scalding dairy equipment twice daily. This unit is now ready for demonstration.

Plate 4.—A Solar Water Heater for Use on Dairy Farms.

Cooling Equipment.

The value of farm refrigeration for improving the quality of dairy produce, particularly under Queensland conditions, has long been appreciated. Consequently, steps have been taken to demonstrate units which may be cheaper than those at present available. Three American type drop-in units have been demonstrated on farms and have given very satisfactory results over the past 12 months. To effect a saving in the cost of two units, farm-built concrete cabinets with insulated wooden lids have been constructed. This type of cabinet has been made at a cost of £70 on the farm and has proved efficient. With the attachable compressor and drop-in refrigerant coil, this type of farm refrigerator could be provided for about £200, or approximately half the present average price of farm refrigerators.

On 49 farms, demonstrations have continued with cheaper forms of evaporative cooling methods for milk and cream. A paper on these coolers has been prepared for publication, illustrating their value and efficiency in relation to cheese-milk and cheese quality improvement.

Dairy Rubberware.

The dairying industry has expressed concern at the rapid deterioration of milking machine rubberware and efforts were made to determine the principal causes and possible remedies to prolong its working life. The previous year's work emphasised the importance of fat absorption in the rapid deterioration of natural rubber, and synthetic rubber was tried to reduce the fault.

It has now been shown that certain types of synthetic rubber can be used in the compounding of "rubberware" suitable for use in dairies. Demonstrations with this synthetic under commercial conditions showed that the type of inflation maintained a better tension and a smoother surface than the "natural" inflation; it does not soften, become sticky, or swollen like natural rubber (Plate 5).

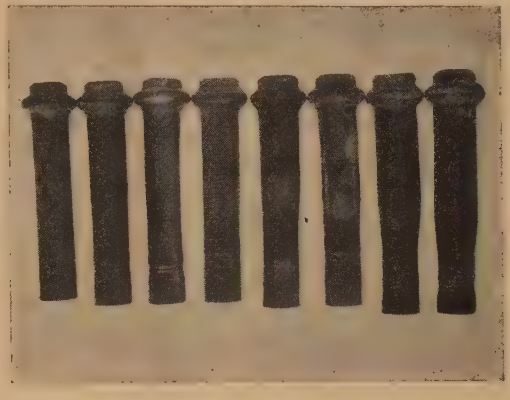


Plate 5.—Showing the Deterioration of Rubber Milking Inflations as the Percentage of Synthetic Rubber Decreases (left to right).

On one farm, milking 16 cows per set of cups for an average production of 2 gallons of milk per cow, a set of this type of synthetic bulb top inflations was still unaltered after 7 months' use, whereas 8 sets of natural inflations were used on an adjacent set of cups in the same machine.

PUBLICATIONS, ETC.

Ten papers were prepared for publication in the *Queensland Agricultural Journal*, *Queensland Journal of Agricultural Science* or *Journal of the Australian Society of Dairy Technology*. Eleven radio talks were given by officers of the Branch, as well as 15 addresses to various dairying industry organisations, field days, etc.

DIVISION OF MARKETING: BRANCH REPORTS.

MARKETING BRANCH.

Mr. H. S. Hunter, Director of Marketing.

MARKETING.

The most significant feature of the Australian economy over the last 12 months has been the improvement in the balance of payments situation. During this period the value of exports exceeded that of imports by £276m. This was in contrast to the previous year, when the imports exceeded exports by £39m.

Those rural industries which assume high significance in Queensland have largely contributed to this important change, although the lagged effect of import controls has obviously resulted in the scaling down of expenditure on imports.

Notwithstanding the increased export earnings resulting from higher prices for wool, which has been by far the main individual item, earnings from cereal grains and sugar have been increased as a direct result of increased volume. The export earnings from meat, dairy products and eggs were below the level of the previous year as a result mainly of unsatisfactory prices realised on the United Kingdom market; quantities exported were also lower.

Fig. 1 compares Australian export earnings and import spending for the current year and for the preceding 12 months. The extent to which the recovery is attributable to wool is clearly evident.

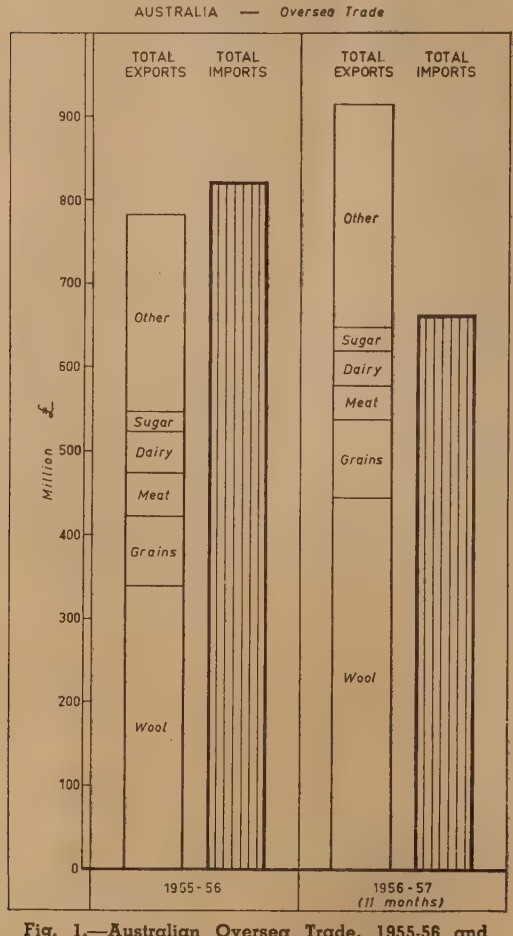


Fig. 1.—Australian Oversea Trade, 1955-56 and 1956-57 (11 months).

Although the improvement in the balance of payments position is gratifying, the problem for the export industries is still the narrowing gap between costs and prices, to which reference was made in last year's report. The narrowing of the gap has proceeded from both sides; costs have continued to increase while overseas prices have weakened. Some of the increased costs arising from such factors as shipping costs are beyond the control of producers or of the Australian authorities. Moreover, this development has continued in spite of the definite restraining influence of restricted credit facilities which, in turn, has been acutely felt by primary industry in its endeavour to counter narrowing profit margins by increasing production and efficiency.

Associated with the problem of the export industries, therefore, is the whole problem of the balance of payments. While imports and credit restrictions continue, a free level of imports obviously does not obtain, and the extent of the dependence of the economy on wool prices is not fully evident. A reversal of the balance of payments position could easily follow a fall in the volume of wool exports resulting from, say, severe drought conditions or from a fall in prices which might result from increased competition from synthetic fibres. This potential instability of the economy serves to emphasise the need for increased efficiency in all sections of industry, including rural industry other than wool. From this must follow higher quality standards, without which the effort now being expended on trade promotion by the Commonwealth Government, in association with the marketing organisations, in recognised and potential markets will be of little or no avail.

In striving to attain a state of relatively stable economic balance, regard must be taken of practices now being adopted in those countries accepted as predominantly industrial, but whose policy since the war years has been to support their primary industries with guaranteed prices. These practices have so increased the volume of primary production in these countries, of which the United Kingdom and the United States of America are outstanding examples, that formerly satisfactory markets for Australian rural products are not only vanishing rapidly but surpluses in these countries have accrued and are being dumped on world markets. Consequently, with this increased pressure on the necessity of attaining a high level of national economic self-sufficiency, greater attention is being directed in Australia to import-saving industries, not only secondary but also primary.

In the rural industries the extension of these import-saving industries has particular significance in that production of commodities such as tobacco and cotton effects a saving of "dollars" as well as other exchange, while for Queensland farmers in some areas they offer the opportunity of alternative crops. The Tobacco Leaf Marketing Board and the Cotton Marketing Board appreciate the significance of expanding these crops, and the need for efficiency and economy in their production has been recognised in the attention given to formulating satisfactory grade standards, and interest taken in the Department's research activities aimed at improving the quality of crops and cultural and harvesting methods.

Within the Marketing Branch steps have been taken towards the formation of an economics section as an aid towards improving the Department's agricultural aid extension service. The Branch will provide economic information to assist in the promotion of efficient production.

A more detailed account of these investigations and of the various primary industries of significance to Queensland is given in following sections of this report.

EXPORT COMMODITIES.

Pastoral.

The output of wool in Australia in 1955-56 at 1,410 m. lb. (greasy equivalent) was approximately 9 per cent. above the previous record established in 1954-55, notwithstanding the effects of the shearing dispute and heavy rains. The 1956-57 season resulted in a further increase in production of 11 per cent. to 1,565 m. lb. Average Australian value realised for greasy wool was 79.66d. per lb. compared with 61.46d. per lb. in 1955-56; while exports increased by 165 m. lb. to 1,429 m. lb. greasy equivalent and their value from £337m. to £485m.

Queensland sales for the season totalled 798,906 bales and exceeded the record 1942-43 selling season of 659,536 bales. Total exports to the United Kingdom, the principal market, showed an increase of over 10 per cent. on the year earlier, and those to Japan, France, Belgium, Poland and Western Germany were all substantially higher; in contrast, shipments to the United States of America were down some 22 per cent. With a rise in world living standards and a continuation of sound economic conditions, it can be expected that a keen demand for wool will be maintained, and the outlook for wool must be regarded as very favourable.

The beef cattle industry has again experienced a very favourable season, although production during the first half of the year was below that of the same period 12 months earlier, due to the abnormally wet conditions which delayed movement of cattle in the export production areas. With heavier slaughterings in 1957, however, it is expected that new production records will be established.

Prices for beef on the United Kingdom market continued to be depressed as a result of large imports from other production areas, particularly the Argentine, and the high level of United Kingdom domestic production. Prices for Australian frozen beef pitched at Smithfield were generally lower than in the previous season, although they improved towards the end of the financial year. Marketing authorities have attributed this to a seasonal fall in United Kingdom domestic production and a temporary shortage of Argentinian chilled meat. With the lower volume of exports and excluding deficiency payments due under the 15-Year Meat Agreement, export earnings were 15 per cent. below 1955-56. It is of interest in gauging the value of the Agreement that deficiency payments by the United Kingdom Government with respect to 1956 sales of beef amounted to £3,250,000.

With higher wool prices and good seasons, lamb and mutton production was lower, with consequential effects on both the quantity and the value of exports.

The export of live cattle from northern Queensland to South-East Asian countries is an aspect of the cattle industry which has become of value to Australia, as well as contributing to the solution of the balance of payments position. It has been stated by the Federal Minister for Primary Industry that this year more than 10,000 head of cattle will be exported.

Dairy and Farmyard Products.

Production of butter in Australia was 16,000 tons less than for the previous season, while cheese production increased by some 6,000 tons, mainly due to a recovery to 1954-55 levels in Victoria. In Queensland, butter and cheese production were down 15 per cent. and 6 per cent. respectively.

Overseas market conditions for the industry are still very much influenced by the depressing effect on prices caused by the heavy stock position arising from surpluses accumulated in the U.S.A. The United Kingdom market for Australian butter, after having risen to 400s. stg. per cwt. in 1955 following the reversion to free market conditions, fell to 287s. per cwt. during the first half of 1956 and reached the low level of 247s. per cwt. early in 1957; prices did not recover until May following the clearing of United Kingdom stocks and, it is claimed, improved marketing practices. By the end of June the price had risen to 319s. per cwt. Cheese prices, although they also declined with the building up of stocks during the year, had recovered at the time of writing.

During the year a new Five-Year Stabilisation Plan to operate from July 1, 1957, was approved by the Federal Government after consultation with the industry; the new plan substantially follows the previous plan.

The year under review proved another difficult year for the poultry industry; this was attributable directly to the collapse of the market in the United Kingdom and Western Germany for eggs in shell. In Queensland this development was aggravated by an increase of 12 per cent. in commercial production in comparison with the previous season.

While the current high level of production—estimated at 95 per cent. of annual domestic requirements—prevails in the United Kingdom, it is unlikely that remunerative prices for eggs and egg products will be realised by exporters to that market. With the establishment in the United Kingdom of a National Egg Marketing Board and the continuation of guaranteed prices under the Agriculture Act, high domestic production can reasonably be expected to continue. The average price realised for sales of eggs on European markets was 2s. 8.7d. stg. per doz., compared with 3s. 11.2d. stg. per doz. in the 1955-56 season. The return to growers after meeting all costs of shipping, storage, refrigeration, packing, etc., was approximately 1s. 6d. (Aust. currency) per doz. delivered to the Board's floor.

Following the collapse of the market of eggs in shell, surplus spring production was packed for export as liquid egg pulp for which a fixed price of £225 8s. stg. per ton f.o.b. Aust. ports had been negotiated, returning the grower approximately 2s. 3d. per doz. net, delivered to the Board.

The unprofitability of exports, together with low prices offered for poultry for slaughtering, must result in the elimination of some flocks. The marketing organisation itself realises the necessity of concentrating its efforts on exploring new markets and increasing local sales. In both cases, higher efficiency and service are imperative, while it seems likely that even lower local prices must be determined in an endeavour to achieve the objectives.

Fig. 2 gives some indication of the extent to which prices for Australian exports of meat, dairy and farmyard products on the United Kingdom market have changed during the year. The market prices quoted are at the end of March in each year except in the case of eggs, where the prices ruling at the end-of-season sales are shown.

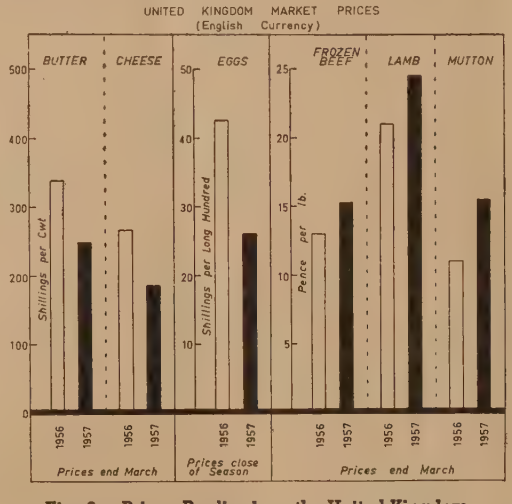


Fig. 2.—Prices Realised on the United Kingdom Market for Certain Australian Primary Commodities, March, 1956 and March, 1957.

Sugar.

The international sugar situation has changed radically from its depressed state 12 months ago. Although partly influenced by the Suez crisis, the increase in price is solidly based on a genuine shortage of sugar, which appears likely to persist throughout 1957. In Cuba, the largest supplier to the world free market, production and stocks have fallen, and European beet crops are below those of the 1955-56 season, particularly in Eastern Europe. Statistics published by the Food and Agriculture Organisation of the United Nations indicate that world sugar consumption rose by 30 per cent. between 1951 and 1956, overtaking an increase of about 20 per cent. in world production. In the short run, therefore, a high demand is meeting a supply which is inflexible and backed by small stocks.

Restrictions on exports under the International Sugar Agreement have been temporarily suspended and this permits Australia to export above her international quota of about 20,000 tons, at prices currently above those obtained under the negotiated price mechanism of the Commonwealth Sugar Agreement. The accompanying graph shows how the world price has risen from 3.25 cents per lb. in January, 1956, to 6.15 cents per lb. in June, 1957. The graph also shows how

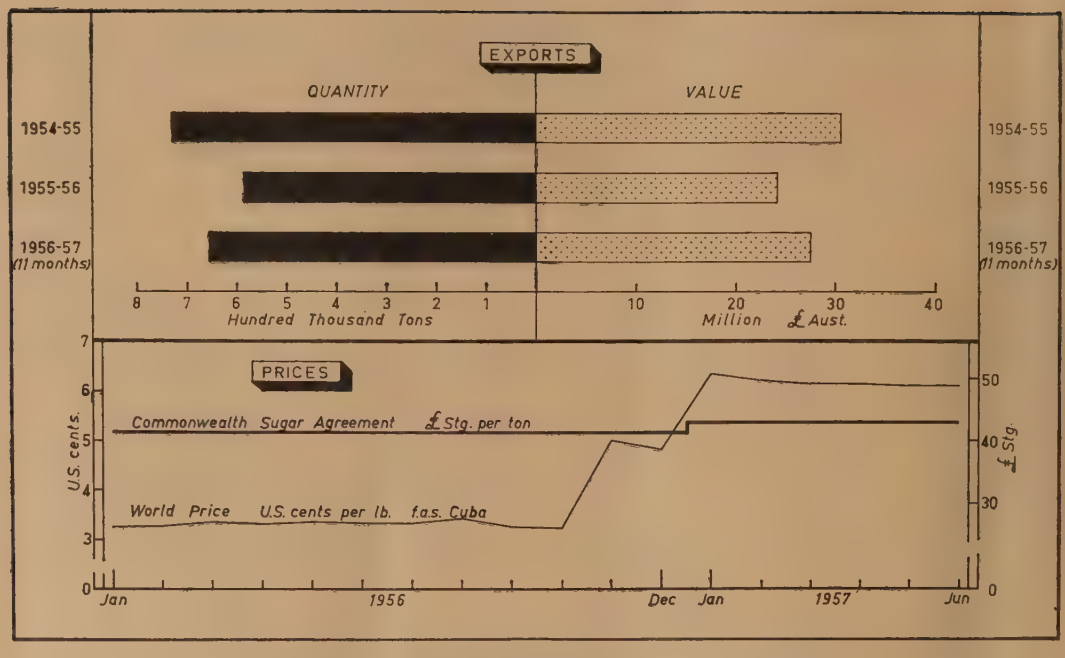


Fig. 3.—Quantity and Value of Australian Sugar Exports, 1954-55 to 1956-57; Variations in World and Commonwealth Agreement Price During 1956-57.

both the quantity and value of exports have increased this year, making a worthwhile contribution to easing the balance of payments problem. Because of these exceptional circumstances it is the intention of the Queensland Sugar Board to accept for marketing the whole of the 1957 season's production. The Board has recently sold 100,000 tons of raw sugar to Japan.

The negotiated price for 1957 is £42 3s. 4d. sterling c.i.f. per ton, compared with £40 15s. per ton in 1956 and 1955. Quantities in excess of 300,000 tons, the negotiated price quota, which may be sold within Commonwealth preferential markets are sold at world market price plus preference.

With control of production, markets are not a major problem for Australia. Bulk handling, mechanical harvesting and handling, and improved varieties of cane with high sugar content are lines of approach being followed by the industry to improve productivity in the face of rising costs.

Fruit.

Canned pineapple products make up the bulk of Queensland's fruit exports and the United Kingdom is the main outlet. Sales of canned pineapple on this market have been very slow in the past year and it is thought in some circles that saturation point has been reached at current price levels.

Pre-war, 90 per cent. of United Kingdom supplies came from Malaya and with her recovery from war-time devastation that country is once more a strong competitor in the United Kingdom market. Increasing competition is also being encountered from South Africa and Formosa. Rehabilitation of the Formosan industry is being aided by funds from the U.S.A. At a conference of representatives of the pineapple canning industries of South Africa, Australia, Kenya and Malaya, held in London in May, 1957, a resolution was passed calling on the United Kingdom for protection against imports of Formosan canned pineapple. To meet this increasing competition, Queensland producers are limiting their offerings on the United Kingdom market to choice grade only.

The Australian home market has been able to absorb the additional supplies available and appears capable of absorbing further quantities.

Grain and Seed Crops.

The grain situation in Queensland this year has been dominated by a shortage of local supplies for both flour milling and stock feed.

The export trade in premium flour from Queensland has been restricted in an endeavour to ensure adequate supplies of Queensland wheat for domestic flour consumption until the next harvest. Wheat has been imported from southern States to meet a deficiency in supplies for stock feed. The Barley Marketing Board stopped the export of barley early in the year and reserved all available supplies to meet local demand for stock feed. An approach has been made to the Commonwealth Government to place the export of grain sorghum from Queensland on the restricted list, but so far this approach has not been successful.

The present picture is that commercial supplies of feed grains are nearing exhaustion and from August until about November, when the harvest of winter grain crops begins, the only supplies available to feed grain users will be wheat imported from southern States and stocks of grain held on farms. Ample stocks of feed wheat are available in southern States, but the cost of transporting this grain to Queensland is high—over 4s. 6d. per bus. to *ex* store Pinkenba at present.

Total production of all grains normally used for stock feeding from the last winter and summer harvests was only about 17 million bushels, compared with 26 million bushels the previous year. Smaller harvests were recorded for all of these crops but wheat contributed most to the reduction. The 1956-57 wheat harvest, estimated at 8 million bushels, was little more than half the previous year's production of 15 million bushels.

Because of unsatisfactory planting conditions for both winter and summer crops, the total acreage sown to grain and seed crops fell by approximately 100,000 acres. The fall in the wheat acreage, however, was nearer 200,000 acres owing to a substantial sowing to linseed and canary seed. Yields per acre of feed grains (including wheat) were also lower, averaging about 16 per cent. less than last season's, although on the whole they were fairly close to average performance.

The position in which Queensland now finds itself in relation to grain supplies highlights the need to greatly increase the total acreage under grain crops in this State. The acreage under wheat could be expanded considerably. Queensland wheat has been in strong demand at premium prices on overseas markets, particularly Japan, and provided present quality is maintained or improved there is no need to fear that increased production would result in unsaleable surpluses. In the meantime, these markets have had to be sacrificed because of inadequate supply.

The overall Australian wheat stocks position should show considerable improvement by the end of this year, and carryover at the end of November should be only about half last year's figure of 84 million bushels.

World wheat stocks, particularly on the Northern American continent, are still large and United States "disposal policies" are still disturbing, but this should not interfere greatly with the marketing of Queensland wheat.

World market prices for grains have not changed greatly during the last 12 months except in relation to the small seeds such as canary seed and Setaria ("panicum"). The market for Australian canary seed is weak at present and shippers' quotes of around £52 stg. per ton c.i.f. United Kingdom are attracting little interest. By comparison, good sales were made at over £90 stg. per ton c.i.f. during the first half of last year. Recent quotes for Setaria have been around £40 stg. per ton c.i.f. United Kingdom, compared with £47 per ton at this time last year.

Shipping freights, which rose to very high levels during the Suez crisis, have eased considerably during recent weeks and this reduction has greatly improved the Australian growers' position in relation to export grain sales.

IMPORT-SAVING COMMODITIES.

There is considerable scope for expanding the import-saving industries to meet Australian domestic requirements. The problem is not the establishment of a market but of ensuring stable and satisfactory returns to growers and thereby inducing increased production. The problem is common to all import-saving industries.

Tobacco Leaf.

With the setting up of the Tobacco Industry Trust Fund to finance research and extension, the tobacco industry has taken a major step towards creating an efficient and stable tobacco industry in Australia. Whilst much of the work carried out under this Fund will be of a long-term nature, there should also be immediate benefits. The increased co-operation between Commonwealth and State Government authorities, tobacco growers' organisations and tobacco manufacturers is already proving helpful in the marketing sphere.

The 1956-57 tobacco crop is a record for the State. It is estimated that some 2,370 tons of Queensland-grown leaf and more than 600 tons of New South Wales leaf will be delivered to the Tobacco Leaf Marketing Board before the season ends; last season's deliveries totalled only 1,881 tons from Queensland and 233 tons from New South Wales. Increased plantings were made in all districts, but the most outstanding feature was the recovery in the Inglewood-Texas-Yelarbon district following the devastating floods early in 1956. Although the North Queensland acreage was higher this year, production fell by about 13 per cent.

During the year some 3,530,000 lb. of leaf from the 1956-57 crop was sold on Queensland floors for a total of £1,933,000; about 5 per cent. of the leaf offered was unsold. The average price realised was 5d. per lb. below last year's average. This was the lowest average price realised since the 1952-53 crop.

The marketing situation continues to be the subject of much attention. The auction system of selling is made less effective by the absence of buyer competition and by the concentration of manufacture in the hands of one company. The absence of buyer competition also reduces the effectiveness of the system of import duty rebates, which could be a potent factor in ensuring the absorption of Australian leaf. In the absence of this condition, some form of long-term price agreement between manufacturers and growers' organisations would seem to be essential to the stability of the industry. So far no such agreement has been reached.

In 1957-58 the qualifying percentages for import duty rebates will be 12½ per cent. in the case of cigarettes and 21 per cent. in the case of cut tobaccos; in 1958-59 these will be increased to 14½ per cent. and 22½ per cent., compared with 7½ per cent. and 17½ per cent. respectively in 1956-57. The increased percentages should give some further measure of assistance to the industry.

Oil Seeds.

The production of vegetable oil seeds is largely confined to Queensland. Of these crops, linseed alone is grown primarily for oil extraction purposes. Linseed has now attained a high measure of stability and permanency among Queensland grain crops. This is due in no small measure to the satisfactory price of £70 per ton offered by the Linseed Crushers' Association and to the announcement of a guaranteed price early in the planting season. The advance knowledge of a firm and satisfactory price and its prompt payment on delivery has influenced farmers to sow increased acreages to linseed. With other grain crops where sales are made on a number of markets at different prices, final settlement is not possible until the complete harvest has been disposed of.

In contrast to last year, conditions for the harvesting of the peanut crop were very good. The quality of the peanuts was excellent, although the Board intake is estimated at 8,000 tons in comparison with 8,900 tons in the previous year.

The industry is alive to the necessity of improving its efficiency and the quality of its product. This season the Peanut Marketing Board has instituted a grading system to encourage growers to produce a nut of better quality. In conjunction with this Department and the Department of Primary Industry, the Board is to carry out experiments in the artificial drying of peanuts. Last December the industry was instrumental in the C.S.I.R.O. undertaking rain-making attempts in the South Burnett to alleviate the very dry conditions then existing, and it is proposed that, if necessary, further attempts will be made next summer.

Application has been made to the Tariff Board for increased protection on both nuts and oil. The first hearing was held in Brisbane in May, 1957. The tariffs requested were 10d. per lb. on peanuts and 7s. 6d. per gallon on peanut oil. Current tariffs are 6d. per lb. and 2s. 10d. per gallon respectively.

Due to good harvesting conditions this year, 97 per cent. of the cotton crop harvested to date is of knitting and weaving grades of cotton. In the previous two seasons poor harvesting conditions resulted in almost half the production being of low quality. Disposal of these lower grades was difficult and resulted in acute financial problems in the industry; these were worsened by reduced world cotton prices.

Bounty payments under the Cotton Bounty Act, 1955, are usually made at the end of the season, but to assist the industry in this difficult period the Act was amended to provide for advance bounty payments. The Cotton Marketing Board has applied to the Commonwealth Government for the guaranteed prices to growers to be extended for a further five years; the present guarantee expires at the end of 1958 and the industry is seeking a longer guarantee term. Without the confidence which a long-term guarantee would undoubtedly inspire, growers seem unprepared to risk investment on specialised machinery, a necessary prerequisite to expansion of cotton growing.

Other Crops.

Two other crops, the expansion of which could assist in import saving and for which production falls short of domestic requirements, are ginger and navy beans.

The Queensland ginger industry is at present in a peculiar position. Queensland ginger production and processing have been developed over years of experimentation to supply a product of high quality for the sweetmeat trade. Seed supplies, however, have fallen to a very low level because of the economic decline of the industry prior to the granting of effective tariff protection in 1955. Tariff protection, together with local processing of imported ginger in syrup, has enabled growers to remain in the industry. To ensure seed supplies for the 1957 crop, practically all of the current harvest is to be withheld for seed.

The demand for locally produced navy beans has remained firm since the industry was established during the war to help meet the requirements of the armed services. Although The Navy Bean Marketing Board was set up in 1946, production in recent seasons has decreased considerably due to unfavourable harvesting conditions. This year there has been a welcome increase in plantings, but growing conditions have been very dry. Demand from canners remains strong and the prospects for the industry are bright.

COMMODITY MARKETING BOARDS.

A detailed description of the activities of the various commodity marketing boards operating in Queensland will, as in previous years, be given in the Annual Report by the Director of Marketing to the Honourable the Secretary for Agriculture and Stock, as required by *The Primary Producers' Organisation and Marketing Acts, 1926 to 1957.*

AGRICULTURAL ECONOMICS.

Rising production and distribution costs relative to prices are the main concern of the farming community today, and farmers and industry leaders are looking for ways of maintaining and increasing the margin between returns and costs. This situation has produced a heavy demand from farmers and extension workers for information on the economics of farm operations.

The Marketing Division recognizes the pressing need for economic research in order to provide this type of information, but work of this nature is exacting in its demands on manpower, time and transport, and the staff position has not so far permitted the assignment of suitably qualified officers to this work on a full-time basis. Despite staff limitations, a start was made on economic research work during the early part of 1956.

Pineapple Industry Survey.

Prior to the year under review, the pineapple industry, represented by the Pineapple Sectional Group of the Committee of Direction of Fruit Marketing, had asked the Council of Agriculture to conduct a study of the economics of pineapple production. The Council of Agriculture approached this Department for assistance in the project, and this survey has been the major research project during the year.

The survey was designed in two parts. At the farm level, an attempt has been made to establish relationships between profitability and such things as farm size, amount of labour available, capital investment, and such efficiency ratios as output per labour unit, yield per acre and cash costs per acre.

The other section of the survey was of a structural and institutional nature. This was designed to provide detailed descriptive information about the size of the industry on a geographical basis, the number of growers in different size groups, trends in production, the extent to which various cultural practices are carried out in different regions and on different sized farms, and farmers' attitudes towards such things as prospects, problems and prices.

During this survey, 303 pineapple farmers in all pineapple growing districts from Mossman to the border were interviewed on their farms with a prepared questionnaire. Field work commenced towards the end of September, and with the exception of the Far North—Cairns, Innisfail, Magnetic Island, Mackay—was completed by Christmas. The Far Northern areas were surveyed in March.

The field work involved about 25 man-weeks. This was shared by three officers of the Marketing Branch and the Secretary of the Council of Agriculture (Mr. J. A. Jones). Preliminary statistical work was performed by the C.O.D., who also assisted in the initial processing of the data obtained under the direction of this Branch. The report is now nearing completion and should be available early in the new financial year.

This type of work makes heavy demands on manpower and this will be the main limiting factor in the development of this phase of the Branch's activities. Field work once commenced must be completed within as short a period as possible. The cost of collection of survey data represented by travelling expenses and transport is considerable but inescapable. The Committee of Direction of Fruit Marketing met the cost of travelling expenses and provided the necessary transport.

The principle of co-operation with industry organisations has advantages apart from those of a financial nature: it ensures that the problems studied are real ones that are recognized by the industry. The implications of a general extension nature arising from this co-operation are obvious.

Further farm surveys are projected for the 1957-58 financial year. The major work will be an investigation into certain economic aspects of dairy production. A study of the economics of pasture improvement and fodder conservation is also being designed. This will probably involve, with the assistance of co-operating farmers, the regular collection of cost-of-production data in a pre-determined form over a number of years.

Canegrowers' Costs of Production.

During the year, at the request of the Central Sugar Cane Prices Board, the Assistant Director of Marketing (Mr. C. H. Defries) carried out an investigation into the methods and procedures adopted by that Board in determining the cost of producing sugar cane. One of the functions of this Board is to allocate the return from the sale of sugar between the growers and the mills. As a basis for determining this allocation, the Board annually collects figures relating to production costs from millers and a sample of growers. This investigation was concerned with technical aspects associated with the collection and analysis of growers' costs of production.

Crop Reports and Forecasts.

A major development in this line of activity during the year has been the decision to supplant the individual reports on wheat, maize, grain sorghum and barley with combined reports on Winter Grains and Summer Grains. In addition to wheat and barley, the winter reports will include canary seed and linseed, while the summer reports will now include white French millet and panicum in addition to the two main summer grains. The decision to expand the coverage of the Crop Reports is the result of an increasing number of requests from grain growers and the grain trade.

A further feature of the new system is that a grid pattern has been drawn over all the grain growing areas and the aim is to have each grid square represented by a grower. This new system will eliminate some of the weaknesses of the previous system and will result in the crop forecasts being placed on a more secure mathematical basis.

Report on Production Trends.

This monthly report is now in its twelfth year of publication and has won general acceptance as the authority on conditions in the rural industries of this State. The report publishes summarised versions of the most recent Crop Reports and Forecasts, as well as current information supplied by the Divisions of Animal Industry, Plant Industry and Dairying, the Commonwealth Meteorological Bureau, the Bureau of Sugar Experiment Stations, Marketing Boards and cold storage firms.

Market Price Reports.

Market Reporters of the Marketing Branch are in attendance each day at the Brisbane Wholesale Fruit and Vegetable Markets and Roma Street Auction Sales. Official Market Quotations are issued daily to radio stations, newspapers, buying organisations, sellers, providors, public utilites and packing houses. A Weekly Market Report giving an overall picture of the week's trading, together with criticism and comment designed to be of value to the supplier, is also issued. This periodical receives wide publicity in the country press and growers' journals.

During the year, Rockhampton was added to the list of coastal cities for which Official Market Reports are prepared. This service is now available at Cairns, Townsville and Rockhampton. Reports are prepared by officers of the Division of Plant Industry, acting for this purpose under the general direction of the Marketing Division.

As from June 24, 1957, at the request of the District Contract Board of the Department of Supply, fish prices have been included in the daily Official Market Prices. This information is supplied by the Fish Board daily and lists the prices realised for each variety of fish at auction at the Fish Board Depot, South Brisbane.

Grain Abstracts.

During the previous year, the Marketing Branch commenced the publication of a periodical known as "Grain Abstracts." Through this publication, information on grain prices obtained from various sources, both Australian and overseas, is presented in summarised form. It is distributed to newspapers, growers' representatives on grain marketing boards, and crop correspondents. The past year has been one of rapidly fluctuating prices in the grain world, and growers have exhibited a lively interest in this publication.

GENERAL.

Acts Amendment.

With a view to assisting Marketing Boards in the policing of the Primary Producers' Organisation and Marketing Acts and thereby aiding in more efficient organised marketing, the Acts were amended to enable the constitutions of the various Marketing Boards to provide by Order in Council extra powers such as the licensing of vehicles carrying the commodity controlled by the Board, enabling inspectors to stop and examine vehicles suspected of illicitly carrying the commodity and to seize and deliver to the Board any of the commodity seized. Provision is also made to require growers and other persons to keep records of sales and purchases, and to enable inspectors to enter premises to examine the commodity or to inspect or obtain information.

Marketing Board Elections and Referenda.

During the year ballots were conducted in connection with the election of growers' representatives on a number of Marketing Boards for a triennial term of office. These included the Atherton Tableland Maize, Barley, Butter, Cheese, Cotton and Egg Marketing Boards and the State Wheat Board. A by-election to fill a vacancy on The Northern Pig Marketing Board was also conducted.

As regards an extension for a further three years of the operations of The Ginger Marketing Board, a petition for a ballot on the question of the extension was received. The ballot resulted in a substantial vote in favour of continuing the Board.

A petition regarding the striking of a particular levy to provide for the reimbursement of a donation of £200 by the Millaquin Mill Suppliers' Committee to the Clayton Distress Fund necessitated a ballot which resulted in favour of the levy.

Constitutional Review Committee.

Although the Primary Producers' Organisation and Marketing Acts were amended to assist in strengthening the legal powers of the Boards, the disorganisation resulting from interstate trade outside the Boards, and more particularly pseudo-interstate trade aimed at evading the Boards, still causes serious marketing problems, particularly as regards the cereal and feed grains.

Consideration of a revision of the Commonwealth Constitution by a Committee of Members of the Senate and House of Representatives in the Federal Parliament has resulted in the preparation, by this Department and by marketing organisations in this State as represented by the Council of Agriculture, of submissions in support of amendments of those sections of the Constitution which impinge on orderly marketing of primary produce particularly in regard to interstate trading.

Stabilisation Plans.

The Dairy Industry.—Following agreement with the organisations representing the dairying industry, the Commonwealth Government has introduced legislation which will extend for another five years from July 1, 1957, the system of guaranteed prices which has operated since 1942. The new Five-Year Stabilisation Plan, as did the plan which operated for the previous five years, provides for a guaranteed price for butter and cheese to the extent of local sales plus exports not exceeding 20 per cent. of local sales. The plan provides that the guaranteed minimum return be based upon the cost of efficient production as estimated by the authority established by the Commonwealth for the purpose; it is also subject to the agreement of the State Governments that maximum prices fixed, other than *ex* factory prices, will be based on the *ex* factory price determined by the Federal Minister.

The new agreement differs from previous agreements in that the amount of bounty payable to ensure payment of the guaranteed return will be an amount fixed by the Commonwealth Government, and for the 1957-58 season will be not less than £13.5 m. It is also provided that the Dairying Industry Stabilisation Fund may be used for the benefit of the industry for sales promotion and research purposes.

The Poultry Industry.—Following the unsatisfactory prices which were realised by the Egg Marketing Boards in the various States on sales of eggs in the United Kingdom during the 1955-56 season, and the virtual collapse of that market early in the 1956-57 season, representations have been made by the Egg Producers' Council, supported by the State Egg Marketing Boards and by other industry organisations, to the Minister for Primary Industry seeking the Government's acceptance of a scheme which would provide for the guaranteeing of a minimum return to producers. The schemes are designed to assist the industry in adjusting itself to lower export earnings and a gradual scaling down of production surplus to local requirements.

The Wheat Industry.—The present Commonwealth-wide Wheat Industry Stabilisation Scheme, which has covered the last four wheat crops, will finish with the 1957-58 season. This scheme, which received the support of growers in a ballot several years ago, provides for a basic home consumption price in all States equal to the ruling International Wheat Agreement price at the beginning of each year or 14s. per bus., whichever is the lower, provided that in no event may the price be less than cost of production. The scheme also guarantees cost of production on up to 100 million bushels of export wheat. In practice, these provisions guarantee the Australian wheat grower a return at least equal to cost of production on approximately 160 million bushels of wheat each season.

Potato Marketing.

The Potato Marketing Board, originally constituted on Dec. 11, 1947, to provide a marketing scheme to replace the war-time control exercised under the National Security Regulations, ceased operations on Mar. 31, 1954. Following the winding-up by the Pubilc Curator as Liquidator, the Board was finally dissolved by the Supreme Court on June 24, 1957. After repayment of all revolving levies and other accounts there remained a surplus of £9,259. This sum has been paid into a Trust Fund to be used for the benefit of the potato industry, in accordance with the provisions of the Primary Producers' Organisation and Marketing Acts.

Export Standards for Small Grains.

Following a recommendation by the Hon. the Minister for Agriculture and Stock to the Commonwealth Minister for Primary Industry, a meeting including growers and all sections of the trade was convened and held on May 16, 1957, to consider the practicability of introducing export standards for small grains, particularly canary seed. The introduction of export standards was considered desirable, as quite a number of complaints regarding quality of millet and canary seed had been received over the years. The meeting considered various aspects, such as registration of graders, grade standards, procedures for inspection, fumigation and bagging. At June 30, discussions on these matters had not been finalised.

STANDARDS BRANCH.

Mr. A. A. Ross, Standards Officer.

The activities of the Branch were curtailed considerably during the year because of restrictions in allowable expenditure, the absence on sick leave of the former Standards Officer and periods of long service leave taken by two officers of the inspectional staff. As a consequence, the usual inspectional services could not be provided to the northern and western portions of the State.

A spectacular advance was made during the year in the production of certified seed, due mainly to the appreciation by farmers of the advantages to be gained by its use. Production of certified hybrid maize seed has maintained a steady overall increase since the inception of the scheme, and certified sweet sorghum and Sudan grass seed are also much in demand. Certified tomato seed production showed a 60 per cent. increase over the previous year and future prospects are particularly bright. A notable point is the growing popularity of the certified Q3 tomato variety in the Berri district in South Australia, where it is highly regarded for canning purposes.

Samples of grain analysed for export increased by 21 per cent. over the previous year, there being a substantial gain in the quantity of the small grains used as bird seed. The quality of this grain is somewhat marginal and steps have been taken to institute minimum standards with respect to its acceptance for export.

Fruit and vegetable inspectors have encountered a difficult season due to high prices prevailing for potatoes during the spring and an unprecedented glut of beans and tomatoes during the autumn period. Condemnations on both of these occasions were particularly heavy.

A comprehensive list of pest destroyers registered under *The Agricultural Standards Act of* 1952 was prepared for publication by the Registration section and a revised set of Agricultural Standards (Seeds) Regulations was gazetted.

SEED TESTING.

The volume of work performed by the Brisbane Seed Testing Station was approximately the same as during the previous two years. While there was an expected reduction in the number of samples submitted by inspectors, the steady increase in analyses made for seed merchants has continued; this is a measure of the esteem with which merchants regard this service. Tests made in connection with experimental projects also showed a substantial increase. Buyers of seed, largely comprised of farmers sowing seed on their own property, have again failed to take advantage of this seed testing service, which is free. This may be taken as an indication that sufficient publicity has not been given to the facilities offered.

Storage of certified mother seed has always presented a problem under Queensland conditions, and in order to obtain further knowledge of the factors influencing storage life, a trial has been commenced using metal and polythene-lined containers under atmospheric and cool store conditions.

TABLE 1.

SUMMARY OF SEED SAMPLES EXAMINED.

Source of Samples.	1955–56.	1956–57.
Inspectors of the Branch ..	3,440	1,902
Seed Certification	220	322
Sellers	6,623	6,736
Buyers	149	110
Government Departments ..	813	819
Experimental Projects	190	315
	11,435	10,204

SEED CERTIFICATION.

In the 1955-56 season the amount of hybrid maize seed certified approximated the target set. Only 62 bus. of seed was refused certification: 22 bus. did not germinate satisfactorily and 40 bus. was rejected because the crossing plot was not detasselled correctly.

An important advance made by two growers is the installation of seed-drying plants. These will permit earlier harvesting, thereby increasing yields by reducing weathering and bird and insect damage as well as ensuring that the seed is dried sufficiently to prevent deterioration during storage.

Rejections of seed grown for seed certification purposes comprise 7,136½ bus. of grain sorghum seed and 305 bus. of Sudan grass seed in the 1955-56 season. Low germination and the presence of prohibited weed seeds were the main faults. The prospects for the current season appear excellent as approximately 20,000 bus. of grain sorghum seed are already awaiting cleaning.

Certified bean seed production, which was continued on the same limited scale as in the previous year, suffered reverses, as some crops were rejected due to the development of a prohibited disease, bacterial blight, in the plots. However, as crops for certification have been widely distributed throughout Queensland, the risk of disease was reduced and 63 bus. of certified seed was channelled to seed producers for commercial bean seed production.

The quantity of tomato seed certified during the 1955-56 season was approximately half as much again as in the previous season. During the current season, however, 590 lb. has already been certified, representing a phenomenal improvement on previous yearly production.

Table 2 shows only the production of certified seed; it does not indicate the extent to which the use of certified seed has influenced primary production in Queensland. However, sufficient certified tomato, hybrid maize and grain sorghum seed was produced in the 1955-56 season to plant 33, 66 and 88 per cent. respectively of the State's estimated acreages in the 1957-58 season.

The scope of the certification scheme has been extended to include pasture species, and it is hoped that seed production of certified buffel grass will be under way in the 1957-58 season. The aim is to extend certification to other pasture species as the occasion arises and when suitable mother seed of selected strains becomes available.

From the numerous enquiries received for certified seed of crops such as Rhodes grass, green panic grass and guinea grass which as yet are not being grown under certification rules, the need to extend the certification scheme becomes apparent.

TABLE 2.

PRODUCTION OF CERTIFIED SEED.

Crop.	1954.		1955.		1956.	
	Certified.	Refused.	Certified.	Refused.	Certified.	Refused.
Hybrid Maize (bus.)	8,153	1,248	3,336½	381	9,921	62
Grain Sorghum (bus.)	14,831	..	12,403	4,287½	12,461	7,136½
Sweet Sorghum (bus.)	134	..	448½	301	1,395½	7½
Sudan Grass (bus.)	123	230	71½	814	1,182	305
French Bean (bus.)	14	5	135½	11½	63	..
Cowpea (bus.) ..	..	..	..	..	..	..
Tomato (lb.) ..	61½	..	107½	8½	165½	..

INSPECTION—AGRICULTURAL STANDARDS.

Seeds.

As Table 3 indicates, 2,005 bags of agricultural crop seeds were required to be cleaned under the supervision of an inspector because of the presence of objectionable impurities such as prohibited seed, excessive weed seeds and excessive inert matter. In addition, 145 bags of agricultural crop seeds and 350 lb. of vegetable seed were destroyed, and 761 bags of agricultural crop seed which failed to comply with minimum standards were processed as stock feed. Following the special concentration on the standard of packeted seed during the previous year, when 10,521 packets were destroyed, it was noticeable that a decided improvement resulted during the current period, only 315 packets failing to comply with the requirements of the Act.

TABLE 3.

ACTION TAKEN ON UNSATISFACTORY SEEDS.

—	1955–56.	1956–57.
Agricultural crop seeds cleaned under the supervision of an inspector	239 bags	2,005 bags
Destroyed or otherwise rendered unsuitable as seed—		
(i.) Farm seeds	148 bags	145 bags
(ii.) Vegetable seeds ..	2,205 lb.	350 lb.
(iii.) Packeted seeds ..	10,521 pkts.	315 pkts.
Processed for stock food—		
(i.) Farm seeds	60 bags	761 bags
(ii.) Vegetable seeds ..	1,811 lb.	..

Material other than Seeds.

For various reasons, inspectional work was restricted to the south-east corner of the State. However, opportunity was taken to concentrate on materials other than seed, and 408 samples of stock foods, fertilizers, pest destroyers, growth-regulating materials and veterinary medicines were submitted by inspectors for analysis, compared with 224 samples last year.

An intensive campaign on stock food quality was conducted in the main production centres of Brisbane, Toowoomba and Warwick, and the results proved particularly unsatisfactory. Of 265 samples of stock foods obtained by inspectors, 97 failed to comply with the prescribed standard or manufacturer's guarantee. A number of samples were considerably below requirements and manufacturers were compelled to rectify faults and prevent their recurrence. The position with fertilizer and lime samples was more satisfactory: 10 samples out of 62 suffered only minor deficiencies on guarantees.

Due partly to advancements in analytical techniques, the Agricultural Chemist was able to undertake the analysis of an increasing number of veterinary medicines and pest destroyers, particularly the more modern complex organic compounds. Analysis of these materials revealed that of 49 pest destroyers analysed only four were deficient and then only to a very slight degree, and of 13 veterinary medicines only one was deficient.

With regard to 240 packages of material other than seeds seized under the provisions of the Agricultural Standards Act because of deficiencies, action was taken to ensure compliance with requirements before the materials were released.

TABLE 4.

SUMMARY OF ACTION ON MATERIALS OTHER THAN SEEDS.

—	1955–56.	1956–57.
Samples received from—		
Inspectors	224	480
Buyers	14	7
Seized (bags)	38	206
Destroyed (bags or bales)	13	..

REGISTRATION.

During the year, applications for the registration, re-registration or extension of registration of 2,649 agricultural requirements were received, compared with 2,421 in the previous year. The Agricultural Requirements Board reported on the efficacy of 597 preparations, of which 225 were pest destroyers and 372 veterinary medicines. Five preparations were refused registration.

The sale of a number of well-known pest control chemicals has been discontinued, these having been replaced by an even greater number of new products, most of which contain the newer organic materials.

A 50 per cent. increase in the number of pelleted poultry food preparations registered indicates a definite trend towards this method of feeding. Foods containing added vitamins, minerals and antibiotics are now readily available to stock-owners.

The popularity of preparations based on piperazine is shown by a substantial rise in the number of anthelmintics containing this chemical.

There are 482 stock foods, 258 fertilizers and 31 limes registered in Queensland. The limes include burnt lime, hydrated lime, slaked lime, processed lime, pulverised limestone, earthy lime and dolomite.

IMPORTS AND EXPORTS.

Seeds.

Table 5 sets out details of seeds examined at the port of Brisbane for the purpose of the Quarantine Act and/or the Commerce (Trade Descriptions) Act.

A feature of this table is the large increase in the importation of legume seed, mostly velvet bean from South Africa. The table also shows a substantial increase in our overseas trade in grass seed, practically all to U.S.A., and in miscellaneous seed. Almost all of the latter was Japanese millet, which constituted a new avenue of trade with U.S.A. and Canada.

TABLE 5.

SEEDS EXAMINED.

Kind of Seed.	1955–56.	1956–57.
Imports—		
Farm Seeds—		
Beans (sacks)	2,705	..
Grass (sacks)	45	83
Legumes (sacks)	95	9,990
Miscellaneous (sacks) ..	193	53
Vegetable—		
Miscellaneous (lb.) ..	2,258	1,729
Parcel post (parcels) ..	147	159
Peas (sacks)	310	55
Exports—		
Grasses—		
Paspalum (sacks)	2,119	2,314
Rhodes (sacks)	84	1,047
Miscellaneous (sacks) ..	48	252
Legumes (lb.)	..	206
Miscellaneous (sacks) ..	..	1,350

Grain and Stock Foods.

Reports were issued on 1,595 samples of grains submitted by shippers or agents in connection with which a Government certificate of quality was required either by the Government of the importing country or by the terms of the buyers' contract. These samples represented a total of 57,364 tons of grain, including maize, barley, white French millet, *Setaria italica*, Japanese millet, canary seed and sunflower. Of the samples of grain examined, 61, representing 1,473 tons of grain, were found to contain seeds of Datura, a poisonous weed prohibited in Queensland when contained in either seeds or grain. Fifty tons of linseed meal were examined prior to export. The figures given do not include considerable quantities known to be exported but for which Government certificates of quality were not required.

INSPECTIONS—FRUIT AND VEGETABLES.

Inspection of fruit and vegetables was conducted by officers of this Branch at the Brisbane wholesale markets, Roma street railhead, South Brisbane, Clapham and Wallangarra. In country centres, such inspection was performed in conjunction with officers of the Horticulture Branch.

A direction of the Committee of Direction of Fruit Marketing applying to tomatoes during the autumn period imposed a heavy strain on inspectors, who had to regrade large quantities of fruit.

TABLE 6.

PACKAGES OF FRUIT INSPECTED.

Fruit.	Imports.	Exports.	Condemnations.
Apples	389,364	151,138	6,018
Avocadoes	14	4,578	12
Bananas	24,079	82,507	1,569
Citrus	305,890	82,568	3,274
Papaws	21	75,179	544
Peaches	31,888	6,237	947
Pears	119,529	9,276	1,563
Pineapples	198	440,151	735
Plumbs	15,645	788	495
Strawberries	1,397	17,738	94
Other Fruits	117,540	127,331	4,500

TABLE 7.

PACKAGES OF VEGETABLES INSPECTED.

Vegetables.	Imports.	Exports.	Condemnations.
Beans	36,971	200,510	10,634
Beetroot	183	38,929	1,824
Capsicums	..	26,730	746
Cucumbers	..	199,743	6,672
Onions	71,495	322,247	341
Peanuts	122	81,531	..
Peas	67,956	3,676	625
Potatoes	191,008	140,357	6,562
Pumpkins	116	265,412	3,889
Tomatoes	48,669	736,719	8,488
Other Vegetables	70,368	117,554	14,354

Due partly to the lack of autumn rainfall, the bean crop reached glut proportions which extended to the end of May. Dumpings of stale, seedy and stringy beans during this period were particularly heavy.

A shortage of potatoes during spring 1956 resulted in extremely high prices in all Australian markets. This had the effect of inducing growers to forward unusual quantities of sub-standard potatoes to market in the hope of taking advantage of the inflated prices. Numerous consignments were directed to be re-sorted, and this in turn necessitated re-inspection.

CLERICAL AND GENERAL DIVISION.

Clerical and General: Mr. W. T. Gettons, Assistant Under Secretary (Administrative).

Extension Consultant Service: Dr. G. R. Moule, Extension Co-ordinator.

Mr. W. T. Gettons.

The clerical and general section provides the clerks, clerk-typists, accountants, transport officers and miscellaneous workers necessary to a Department with a staff of 1,178, and with offices throughout the State.

The Division also takes a part in activities not especially allotted to the production and marketing divisions, such as matters arising under the Farm Produce Agents Acts and the Abattoirs Acts, and the Extension Consultant Service.

STAFF.

The permanent staff of the Department at June 30, 1957, totalled 1,178, an increase of 42 over the number employed at June 30, 1956. Of this increase, six were clerical workers.

The clerical staff numbers 217, comprising 89 males and 128 females, as follows:

——	Brisbane.	Country.	Total.
Clerks	79	2	81
Clerk-Typists	71	53	124
Male Assistants	8	—	8
Female Assistants ..	3	1	4
Total	161	56	217

At June 30, 18.42 per cent. of the Department's staff were clerical workers, compared with 18.57 per cent. a year earlier; 66 per cent. of the permanent male clerks occupy classified positions. The lowest clerical classification has a salary range of £905 minimum and £1,005 maximum plus basic wage adjustments.

It is the practice to provide clerical assistance in country centres to relieve extension officers of routine clerical work and thus enable them to spend maximum time in the field. Another advantage of this system is that it enables the country office to be open to the public during all regular working hours. Country offices in 34 centres have clerical assistance. If suitable applicants are available a further eight or 10 offices will have assistance in the coming year.

ACCOMMODATION.

The provision of adequate office accommodation and storage for materials and equipment to meet the growing needs of the Department has been for a long time, and still is, a matter for concern. The building is overtaxed and many of the offices are overcrowded.

Additional office space is badly needed in Brisbane, also accommodation for the preparation of films for extension activities.

Space has been rented in Brisbane for storing equipment and materials, for which there is no suitable storage at the Department.

The Stock Returns Section, which was previously housed in the Treasury Building, is now located at 42 George Street.

The development of the Mareeba-Dimbulah Irrigation Scheme will necessitate the provision of additional laboratory and office accommodation at Mareeba. Further accommodation is required at Dalby.

During the year office premises were leased at Toowoomba for the Division of Animal Industry officers stationed at that centre. Pending extensions to the Court House at Kingaroy, which will provide further accommodation for this Department's officers, premises have been leased in an effort to meet the Department's requirements.

More satisfactory accommodation has been provided in additions to the Court Houses at Miles and Goondiwindi, and extensions being made to Bowen Court House and Police premises at Boonah include office space for this Department. More suitable premises have been leased at Winton.

ACCOUNTS.

Payments from all Funds totalled £2,586,752, compared with £2,093,703 for the previous year. Receipts increased by £136,854 over 1955-56.

The increase in expenditure was due mainly to the payments made towards the cost of facilities for the bulk handling of sugar (£359,391), increases in the Grants to the Stock Fund (£9,152) and the Banana Industry Fund (£2,226), and the operations on the Tobacco Trust Account (£52,547).

The increase in receipts is attributable principally to contributions received from the Commonwealth Government and primary industries, and to stock assessments. Most of the services offered by the Department are free. Where charges apply they are low and do not meet the cost of the services. It is desirable that charges be kept reasonably low as an encouragement to producers to use these services which are provided for their benefit.

RECORDS.

The volume of correspondence handled by the Records Branch was maintained during the year. The total number of inward letters received was 86,154, which together with 9,378 intra-mural memoranda and 54,446 outward letters resulted in a total of 149,978 being actually recorded.

In addition, the usual number of applications, forms, returns, etc., was handled.

COMMERCIAL AND DESPATCH.

The work in this Section continued to increase in conformity with the general extension in the Department. The postage bill was £1,000 more than in 1955-56. Although there was a greater number of articles despatched, the increase was partly due to the increase in postal rates which operated from October, 1956.

TRANSPORT.

During the year 27 new vehicles were purchased to replace vehicles which had passed their economic usefulness, and five vehicles were purchased for use in place of privately owned vehicles which had been operated on a mileage basis, but which were no longer available for official use. Four other new vehicles were purchased.

Of the new vehicles, two were purchased from Commonwealth Extension Services Grant, one from Dairy Cattle Improvement Fund, three from the Tobacco Research Fund and one from Commonwealth Wool Funds.

During the year 19 vehicles have been disposed of, while 11 vehicles are awaiting sale by auction. The Department at present has a fleet of 271 vehicles. In addition, there are 247 officers operating privately owned vehicles for official purposes at mileage rates.

EXTENSION CONSULTANT SERVICE.

Commonwealth Extension Services Grant funds were again made available for an extension consultant service. This report deals with the work of the consultant service under three headings, corresponding with the aims laid down for it at its inception:—

(1) Assisting in the co-ordination of extension,

(2) Training staff in extension methods,

(3) Serving as consultant to the Divisions and Branches in programme planning and other extension activities.

In view of the increasing demands made upon the section, an experienced extension officer was seconded from another Branch to further training in extension methods.

Co-ordination of Extension.

An officer of the section was appointed to the working committee of the "Better Dairying Through Better Feeding" programme, his duty being to act in a liaison and secretarial capacity.

The section assisted in organising a symposium on extension which was planned to provide a review of the present position and to shape an extension policy for implementation during the next few years.

Training of Staff.

For the first time, two schools in extension methods were held in the one year. Twenty-five officers were selected to attend each school.

Both schools were highly successful, all officers increasing their skill in various extension methods. The real test of the benefit of such schools must come from the approach those who have attended develop to their work in succeeding years. In this connection it is heartening to note that many of those who have been through the course are making much wider use of press, radio, and other mass media methods of extension.

A series of lectures on extension methods was also organised for administrative officers of the Department, the purpose being to provide such officers with an indication of the kind of instruction being given to members of their staff at the extension schools.

The induction training in extension methods of a number of new appointees was also undertaken. The training given comprised a short course in extension principles, human relations, public speaking, and the use of mass media methods.

Steady progress was made in the compilation of a series of booklets on extension, which will provide a valuable adjunct to the training given at the schools.

Consultant Activities.

A survey of extension methods being employed within the Department, and those in use elsewhere, suggested that greater use could be made of films as an extension medium. Accordingly a punched card index of all agricultural films available in the Commonwealth was compiled to assist field officers in arranging programmes.

There has been a marked increase, too, in the number of outside organisations seeking the aid of the extension consultant service in the selection of films.

Following a Commonwealth Government offer to purchase certain films required by this Department, a number of new films suitable for extension purposes have been secured by the Department.

As in previous years, the section was responsible for assessing interest in Departmental exhibits at the Royal National Show, and for producing a report listing the possible reasons for the public's response to the individual items.

Many different forms of service relating to extension activities were rendered to the Divisions and Branches. Help was given, for example, in the design of pamphlets, the preparation of exhibits, the making of slides and movie films, the selection of visual aid equipment and forms of power supply, the selection and use of suitable card index and filing systems for extension purposes, the provision of suitable sound tracks to accompany movie films, and the selection and use of continuous slide projectors for show and demonstration purposes.

Liaison with outside organisations was closer than before. Help was given in the selection of films for different occasions. Many of the details involved in the purchase and modification of a panel van and movie equipment, obtained from C.E.S.G. funds for the Junior Farmers' Organization, were dealt with during the year.

PUBLICATIONS.

The distribution of the *Queensland Agricultural Journal* was maintained at about 15,000 copies per month in spite of the raising of the subscription rate and a reduction in the free list. The subscription rate to farmers, which had remained at the nominal sum of one shilling per annum for many years, was increased to five shillings per annum, and those persons who had previously been required to pay 10s. per annum now pay £1. The increases were necesary to bridge some of the gap between cost of production and revenue, and have been accepted by subscribers.

The Journal continued to provide topical information on a wide range of farming matters and all Branches of the Department concerned with production and marketing contributed regularly.

Of the many articles which were contained in the year's issues, 90 were reprinted as advisory leaflets and pamphlets, the aggregate printing being over 250,000 copies. Branches in the Division of Plant Industry contributed 49 of the reprinted articles, the Division of Animal Industry 24, the Division of Dairying 14 and the Division of Marketing 3.

Scientific workers in the Department submitted 22 scientific papers for publication in the *Queensland Journal of Agricultural Science*, the Department's technical quarterly. Sixteen of these papers originated in the Division of Plant Industry and three in the Division of Animal Industry; three were joint contributions.

The second edition of Vol. III. of the *Queensland Agricultural and Pastoral Handbook* series was almost exhausted by the end of the year. Good progress was made with the second edition of the Horticulture Handbook, but the date of issue of this and the second edition of the Farm Crops and Pastures volume is uncertain.

The Department's Weekly News Bulletin was sent regularly to about 100 newspapers and radio stations. Its topical items were widely used in both media, and many farmers sought further information from field officers.

Day-to-day operations of the Department received wide publicity through press releases.

BROADCASTING.

Despite the wider use of radio made by country extension officers during the year, there was a continued demand for talks on tape assembled and distributed by the Information Branch. Material for over 1,000 broadcasts was again despatched.

These talks are intended to supplement the sessions provided by local officers and are usually rather general in nature.

No opportunity of assessing the value of the Department's radio extension activities has yet presented itself, but it is hoped to examine the position closely as regional contributions are increased.

LIBRARY.

An unstable staffing situation in the Central Library reduced the amount of effective service provided to technical officers, but the Library was used considerably for reference purposes.

PHOTOGRAPHY.

Despite restricted travelling by field officers, a large volume of developing, printing and enlarging was handled in the Photographic Section. Nearly 800 different jobs were completed.

An officer of the Section was given special training with film units in New South Wales and Victoria preparatory to undertaking cinematography on behalf of the Department.

EXHIBITS.

As in previous years, the Departmental Court at the Royal National Exhibition attracted many Show patrons.

In arranging this display the aims of the Department are to provide educational features and to remind primary producers of the services which are available to them through the Department. Qualified officers are stationed at the Court throughout the Show period to answer inquiries by the public. The large number of inquiries which were made indicates that this service is worthwhile.

Departmental exhibits were prepared for a number of country Shows, and floats were provided for various processions in Brisbane and other cities.

LOCAL ABATTOIRS.

Under the *Abattoirs Acts*, 1930 *to* 1949, there is authority for the establishment of centralised slaughtering of livestock. The objectives of centralised slaughtering are to have the meat supply treated at well equipped works where operations can be at all times under the supervision of Government Inspectors, and to have the by-products used to the best advantage.

Local Abattoir Boards are constituted to provide facilities in the main centres of population. All the members (except one) of a Local Abattoir Board must be members of the Local Authorities whose areas are served by the Abattoir. The additional member may be nominated and appointed by the Government. If the Board desires the appointment of an additional member, the Government appoints a man who is well versed in abattoir matters so that the Board will have the benefit of his experience. The establishment and maintenance of the Local Abattoir is thus in the hands of the community through their elected representatives—the Aldermen and Shire Councillors. The Department has continued to give the Local Abattoir Boards considerable assistance with their work, and the Government has guaranteed repayment of the loans raised for the building of the Local Abattoirs.

Under the Acts the Local Abattoir Board may provide slaughtering facilities by entering into an agreement with the owner of an established works to have its livestock requirements slaughtered under contract. So far no agreement of this nature has been made.

Boards have been constituted for Local Abattoir Areas at Toowoomba, Ipswich, Bundaberg, Rockhampton, Mackay and Townsville.

The Toowoomba Local Abattoir Board has been operating successfully for 2½ years, and the Bundaberg Abattoir commenced to operate in April, 1957.

The Townsville Abattoir is nearing completion and will operate later this year. Construction of the Ipswich Abattoir has commenced and will be finished during the present financial year.

The Rockhampton Local Abattoir Board has had to proceed cautiously as it could not be foreseen that loan money would be available when required.

The Mackay Board is carrying out work on the abattoir site and will probably begin building during this financial year.

FARM PRODUCE AGENTS ACTS.

Under the *Farm Produce Agents Acts*, 1917 *to* 1932, supervision is exercised over farm produce agents in their dealings with their principals.

During the year the books and records of a number of agents were checked to verify that compliance was made with the Acts and that consignments were being accounted for correctly.

Any person who has consigned farm produce to a farm produce agent for sale on commission has the right to inspect and check copies of all entries relating to the receipt and sale of such produce with agents' books. The consignor may authorise another person to make the inspection. At the request of growers, inspections were made during the year and they were advised of the result of the inquiries.

The affairs of one agency which has ceased trading, and which some growers claim has not met its obligations, are still under investigation.

There are 135 licensed farm produce agents in Queensland, and of these 81 are in the Brisbane area.

By Authority: A. H. Tucker, Government Printer, Brisbane.